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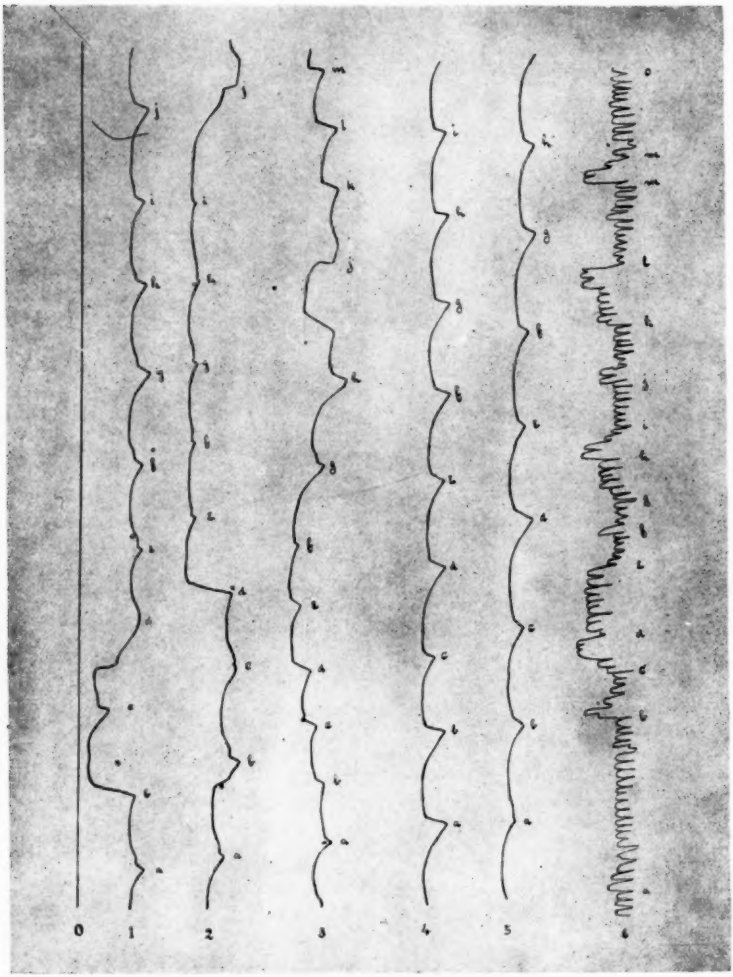
ILLUSTRATING DRS. DODGE AND DIEFENDORF'S ARTICLE ON "AN ANALYSIS OF THE INVOLUNTARY EYE MOVEMENTS."



Vol. XXXVIII. No. 1

ARCHIVES OF OPHTHALMOLOGY.

AN ANALYSIS OF THE INVOLUNTARY EYE MOVEMENTS IN A CASE OF CONGENITAL, BINOCULAR, LATERAL NYSTAGMUS, FROM PHOTOGRAPHIC RECORDS.

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(*With illustrations on Text-Plate I.*)

DURING the course of a comparative study of the ocular reactions of the insane, the writers took occasion to secure photographic records of the eye movements in a case of congenital nystagmus. The patient was a paranoid dement who was committed to the Asylum as a result of some breach of the peace. The records were taken only a few days before his release, when the patient showed considerable improvement. In view of the condition of the patient at the time of examination, and in view of the absence of any especial optical stigmata of mental derangement, we assume that the records give a graphic representation of the involuntary eye movements in a case of congenital, binocular, lateral nystagmus, without serious complication from the residua of mental disease.

For a detailed description of our photographic registering apparatus, its technique, and the tests of its accuracy we must refer to Dodge's *Experimental Study of Visual Fixation*, pp. 79–95.[1] In order to make the graphic representation

[1] Monograph supplement to the Psychological Review, No. 35. *Psychological Review*, Baltimore, Md.

more easily understood one may explain that our records were made by the familiar Dodge-Cline device of photographing the reflection of a luminous point from the cornea of the eye, on a slowly falling photographic plate, by means of an enlarging camera. If the eye had remained absolutely still, the resulting record would have been a single straight line the length of the plate like the base line *O*. Every deviation of the record from a straight line signifies a corresponding lateral displacement of the patient's eye. The obliquity of any part of the line is the resultant of two factors: 1, the velocity of the photographic plate; and 2, the velocity of the eye movement. The reproductions of the records in Plate I. are slightly less than natural size. They were produced by projecting the records with a lantern, tracing the projected records with black ink, and rephotographing the black drawing. It has been found impracticable to reproduce directly from the relatively faint contrasts of the original records. Unfortunately, some of the detail and much of the satisfaction one has in the original records are lost in the reproduction. It is the best we could do.

Each of the lines *1–5* is a continuous record of the movements of the patient's right eye for a period of approximately 2.5″. Line *6* was taken on a slowly falling plate and represents the movements of the same eye for approximately 1.5′. Under the circumstances which conditioned the experiments, the position of any point on any of the lines may be regarded as determined by two main factors. Its vertical position is determined by the momentary position of the falling photographic plate with respect to the recording beam. Its lateral deviation from the vertical is determined by the lateral movements of the eye. These factors are somewhat complicated by secondary considerations, but the records indicate that the latter are slight. They do not enter into our discussion.

The amplitude of any eye movement may be closely estimated on the reproduced record from the fact that the rapid movement to the left (line *2d*) represents an eye movement of 12°. The other movements will show displacements of the recording line which are closely proportional.

All the records were taken from the patient's right eye.

As they are reproduced, oblique lines to the left correspond to nasal movements. Oblique lines to the right correspond to temporal movements. The more nearly any line approaches the horizontal in lines *1–5*, the more rapid was the corresponding eye movement. All records should be read from below up. Perhaps one gets the best possible orientation with respect to the records if one imagines himself to be in the position of the patient, seated before a slowly falling plate, along which a pointer attached to the eye traces a line corresponding to the eye movements.

Lines *1–2* represent the fixation of two different letters 12° apart. Line *3* represents the attempt to follow the bob of a moving pendulum in a pursuit movement. Lines *4–5* are records of attempts to fixate steadily a single letter. Line *6* shows alternate fixations of three letters complicated by some variation in the position of the head. In all these different forms of ocular reaction the peculiar nystagmic irregularities maintain the same general character. Notwithstanding considerable variation in amplitude, each nystagmic wave seems to consist of three phases: 1, A period of fixation with more or less relatively slow fixation drifts. 2, A more rapid temporal movement, which is interrupted by 3, A rapid corrective movement of Dodge's first type.[1]

The first phase suffers the most marked qualitative modifications. It is most irregular in those records that include the fixation of different objects. It is least irregular under the influence of continuous fixation of one object. In the latter case (lines *4–5*) the first phase often reduces to an almost perfect fixation. In the former case a short period of true fixation passes into a slow nasal movement with negative acceleration. This in turn gradually passes into the second phase of the nystagmic wave. The inter-nystagmic drift of the first phase has sometimes been observed, so I am informed, in apparently more pronounced form than was exhibited by our patient while under our observation. In the form shown by our records it is difficult to correlate with any of the normal types of eye movement. In velocity it resem-

[1] Dodge, "Five types of eye movement in the horizontal meridian plane of the field of regard." *American Journal of Physiology*, vol. viii., pp. 301 fol.

bles normal divergence movements (type V[1]) but the antecedent moment of true fixation and the consequent gradual emergence into a movement in the opposite direction effectually disprove the analogy. It is more probably related to the simple fixation drifts of normal vision. Here again the agreement is by no means exact. Normal fixation drifts are never as rhythmically regular; moreover, they always end in a rapid corrective movement of the first type.

The second phase of the nystagmic wave develops out of the first without sharp transition. The nasal drift gradually passes over into a temporal drift with positive acceleration. This phase constitutes the main disturbance of fixation in nystagmus and may be called the nystagmic deviation. This second phase also differs appreciably from every form of eye movement hitherto recorded. It differs from E. B. Holt's nystagmus of dizziness chiefly through its positive acceleration. This fact also differentiates it from normal compensatory and pursuit movements. From one relatively normal subject with marked muscular asymmetry, we have photographs of fixation drifts which in amplitude and general character (including the positive acceleration) closely resemble the nystagmic deviations. They are, however, less frequent and non-rhythmic. Somewhat similar movements are also found in extreme lateral displacement of the globe. In both these analogous cases the cause of the phenomenon is apparent enough. In both cases, a disturbance of normal muscular balance led to fixation drifts which were only corrected by a definite reaction to some stimulus involved in the lapsed fixation.

The amplitude of the nystagmic deviations suffered marked modification within the duration of the records. In line *1*, *e–j*, it increased threefold during a single fixation. A similar phenomenon occurs several times in the condensed record, line *6*. This increase in nystagmic deviation however is by no means regular. In line *2* it is persistently moderate. The causes which produce these marked changes would seem to be worth further study. From the present conflicting data we can venture no hypothesis. Obviously the familiar

[1] *Op. cit.*, "Five types of eye movement," etc.

empirical generalization that fixation increases the nystagmus is only occasionally true.

The third phase of each nystagmic wave shows no variation from normal phenomena. In angle velocity, configuration, and function it qualifies as a movement of the first type, functioning as a corrective movement. The sharp transitions between this and the other phases of the wave are well brought out in the reproductions. In marked contrast to the other phases the regular obliquity of the third phase shows that the velocity was regular. Furthermore, of all the phases the velocity of the third phase is greatest.

The interrelation of the three phases is probably the most important problem to which our data point. The graduation of the sharp corrective movements to the varying extent of the nystagmic deviation seems at first thought entirely natural. Only such graduation would ensure the relatively favorable fixations of the first phase. When one recalls the fact, however, that the ocular reaction times are long, averaging more than 160,[1] and that the rapid eye movements are moments of practical blindness,[2, 3] it becomes obvious that the corrective movement cannot be regarded as a reaction consequent to the nystagmic deviation, and determined by it. In some way or other the corrective movement must be regarded as a co-ordinate movement, having its origin in the same complex motor facts that condition the nystagmic deviation. In some way or other the elaboration of the motor impulse in each nystagmic deviation conditions the elaboration of an appropriate corrective movement. In some way or other the strength of each nystagmic pull is foreseen and the appropriate correction prearranged before the nystagmic deviation actually occurs.

The relation between the first two phases is less puzzling. It appears that the nystagmic deviation impulse does not develop immediately on the renewal of the fixation through

[1] Dodge, "The reaction time of the eye." *Psychological Review*, vol. vi., pp. 477–483. *An Experimental Study of Visual Fixation*, pp. 13–21.

[2] Dodge, "Visual perception during eye movement." *Psychological Review*, vol. vii., pp. 454–465.

[3] Holt, "Eye movement and central anæsthesia." *Harvard Psychological Studies*, vol. i., pp. 3–46.

the corrective movement. That it develops against the resistance of antagonistic muscles is apparent first from its low angle velocity. Free eye movements are more rapid. Still more eloquent of the resistance of antagonistic muscles are those cases where the antagonistic movement appears first, leading to those modifications of the first phase which we have already discussed, viz., the slow fixation drifts in the opposite direction from the true nystagmic deviations. From the data at hand we can reconstruct the nystagmic motor processes with reasonable confidence. The nystagmic deviation develops as a gradually increasing pull against the inadequate but persistent resistance of antagonistic muscles. After the excitement of voluntary eye movements the antagonistic reactions may develop more rapidly than the nystagmic deviation, leading to the anti-nystagmic fixation drifts. The force of the antagonistic reactions may be roughly measured by the difference between the most rapid part of the nystagmic deviation and free eye movements. At some point in the nystagmic deviation a sharp corrective movement develops, at once inhibiting the further development of the nystagmic deviation and returning the eye to a true fixation. It is noteworthy that this interrupting corrective movement must be effected by the same muscles whose moderate resistance has just previously been overpowered by the nystagmic deviation. The inference is almost inevitable that the origins of the two impulses are at different levels of the nervous organization. Indeed the question persistently suggests itself whether the nystagmic deviation is not primarily a matter of asymmetrical muscular balance, which the co-ordinating apparatus is constantly called on to correct without being able to eradicate.

Notwithstanding the marked nystagmus movements (often reaching an amplitude of 5°) our patient presented no gross defects of vision. We had no means of accurately testing his visual acuity but rough tests showed, to our surprise, that it was not much if at all inferior to that of his examiners. In response to questions he assured us that he could n't feel any twitching of his eyes, and that there was no apparent motion of the room or its contents. His nystagmus involved no dizziness and no disorientation. The excellent service that

his eyes gave seemed more difficult to explain at the time of examination than it did after an inspection of the records. From mere observation it seemed as though the patient's eyes were in continuous motion, zigzagging across the field of regard in fairly regular sweeps. The records show that this is only relatively true. Fig. 2[1] shows an analysis of two total oscillations. From this analysis it appears that fully one-half of the total deviation of 5° occupied only one-fifth of the total time of the oscillation. For fully two-thirds of the time the eye was moving so slowly as to be but little more unsteady than is the normal eye during the fixation of a point of light. An analysis of the deviations in lines *4–5* shows even better visual conditions. The rapid corrective movement we know to be a moment of practical blindness. It is probable that a similar lack of clear stimulation occurs during the most rapid part of the nystagmic deviation. The other four-fifths of the time vision would be expected to be fairly satisfactory. With our present knowledge of the visual perception of motion, however, it is not easy to understand how the patient could entirely escape illusions of motion during the slow fixation drifts of the first phase.

Possibly the most important practical bearing of our records is their absolute refutation, in at least one typical case of lateral nystagmus, of von Arlt's well-known hypothesis with regard to the optical motive for nystagmus. In our case at least the main nystagmic deviation could not have been motived by the effort to move the object of interest to a fresh portion of the retina, since the rapid movement of the eyes altogether precludes effective vision during that part of the nystagmic wave when the nystagmic deviation is greatest.

[1] Fig. 2 which cannot be reproduced is an enlargement of Line 1, movements *g*, *h*, and *i*.—ED.

HISTOLOGICAL INVESTIGATION OF A CASE OF BLEPHARO-CONJUNCTIVITIS CAUSED BY THE DIPLOBACILLUS OF MORAX-AXENFELD.[1]

By Dr. BROWN PUSEY, Chicago.

(With six illustrations on Text-Plates II., III., and IV.)

OUR knowledge of the histopathology of blepharo-conjunctivitis caused by the diplobacillus of Morax-Axenfeld—an important subject in eye pathology—is based on the study of one case by Stock. A few investigators have studied small pieces of conjunctival tissue excised from patients suffering with this disease and their findings have supplemented those of Stock, also they have differed somewhat. The study of excised pieces of conjunctiva is of limited value, because, from the nature of things, such tissue can only be taken from the region of the transitional fold where the conditions differ greatly from those existing in the ocular and palpebral conjunctiva, and completely from those existing in the lid edges.

Realizing the desirability of another study, like Stock's, of the whole tissue of a case of this disease, I set about to obtain it, and recently by great good fortune, in one of the large hospitals of Chicago, a case was found a few days before death in a man whose family allowed us to take the whole tissue post-mortem.

Clinically the case was one of chronic blepharo-conjunctivitis occurring in a man. It was one of many cases which were found in a ward where a number of elderly men had been kept together for a long while—the disease was epidemic in the ward. The case presented the typical picture of the disease in the chronic form.

[1] Presented at the meeting of the Am. Ophth. Soc., New London, July, 1908.

ILLUSTRATING DR. BROWN PUSEY'S ARTICLE ON "HISTOLOGICAL INVESTIGATION OF A CASE OF BLEPHARO-CONJUNCTIVITIS CAUSED BY THE DIPLOBACILLUS OF MORAX-AXENFELD."

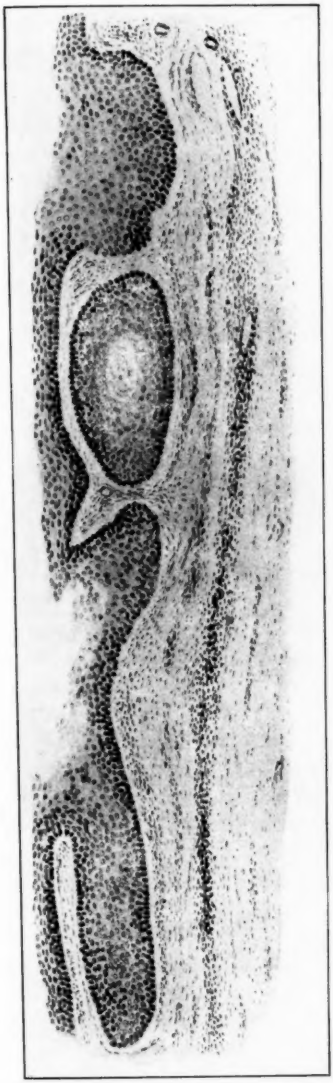

FIG. 1.—Blepharo-conjunctivitis caused by the Bacillus of Morax-Axenfeld.

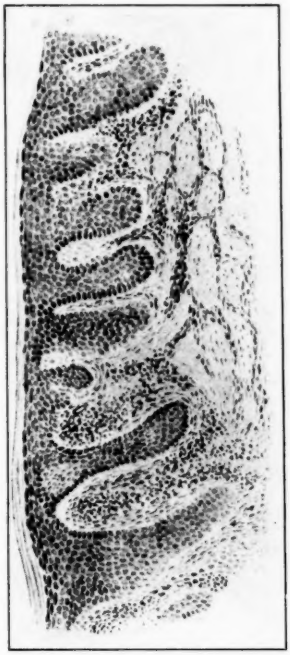

FIG. 2.—The lid-edge in blepharo-conjunctivitis due to the Bacillus of Morax-Axenfeld.

FIG. 3.—The tarsal conjunctiva in conjunctivitis due to Bacillus of Morax-Axenfeld.

The bacteriological diagnosis depends on smears, for through a misunderstanding cultures were not made, though cultures had been made from other cases in the ward. Smears were made from both eyes and typical Gram negative Morax-Axenfeld diplobacilli exist in the smears in great numbers, together with Gram positive bacilli of the diphtheria group and Gram positive cocci. Aside from the bacterial content of the smear it is that usually gotten from eyes infected with the diplobacillus of Morax-Axenfeld, being rich in fibrinous matter and relatively poor in cells, there being only a few degenerated epithelial cells and a few polymorphonuclear leucocytes. Some of the polymorphonuclear leucocytes show phagocytosis of the diplobacilli.

The tissue was fixed in 10% formalin solution, then put into alcohol of ascending strengths, and finally imbedded in paraffin, and celloidin, and sectioned. Sections were stained by various stains.

The histopathology of the four regions, the lid edge, the tarsal conjunctiva, the conjunctiva of the fornix and that of the ball, is markedly different, and for convenience is described separately. Figure 1 shows all the parts.

In the lid edges, the striking change is in the increase of epithelial cells, the new cells growing into the underlying tissue in cone-like masses (Figure 2). This ingrowth of cells in the lid edges is universal, but it is more marked in the lower than in the upper lids. There is no diffuse infiltration of the connective tissues by the epithelial cells as in malignant processes. The superficial pavement epithelium is not composed of as many layers of cells at the inner angle as at the outer, and cornification of these cells stops at about the middle of the lid edges or a little back of the middle. Around the epithelial ingrowths there is an increase of cells, these cells showing the character of new connective-tissue cells with here and there plasma cells and mast cells—there are no lymphocytes and no polymorphonuclear leucocytes. There is a slight increase of blood-vessels. The Meibomian glands are not affected. The glands of Moll as a rule are not affected, but one series of sections shows the lumina of one of these glands filled with leucocytes mostly of the polymorphonuclear variety. I was unable to find micro-organisms in these cavi-

ties and the cause of this abscess formation in all probability was not the Morax-Axenfeld bacillus.

The tarsal conjunctiva is much thickened, the thickened tissue being composed of a mass of folds, tubules (glands of Henle), and new supporting tissue (Figure 3). The folds and tubules have a lining cell wall composed of two or three cells. Within the folds and tubules there are cast-off epithelial cells, mucoid material, and bacteria—diplobacilli. Between the epithelial cells of the walls of the folds and tubules one finds in the superficial layers a few diplobacilli. There are many wandering cells—mononuclears and polymorphonuclears—in the epithelial cell layer. The epithelial cells of this region show a slight tendency to undergo mucoid change. The connective-tissue substructure of this region is cellular and fairly vascular. In it there are small round cells with a relatively large nucleus and a small amount of cytoplasm, larger cells like connective-tissue cells, plasma cells, and an occasional mast cell. Plasma cells are the most abundant. Polymorphonuclear leucocytes occur, but are rare. Returning to the subject of the architecture of this thickened conjunctival tissue, I would emphasize the statement that it is made up of a mass of folds, tubules, and new supporting tissue. Sections made at right angles to the long axis of the tubules (or in other words made parallel with the conjunctival surface) leave no doubt about the fact that they are true tubules.

In the conjunctiva of the transitional fold there is also a great increase of epithelial cells. Here the increase of cells consists of an increase in the number of the cells which make the epithelial cell layer of the conjunctiva, not the formation of cones or tubules. The epithelial cell layer is made up of from four to seven or eight cells and there is marked desquamation of cells. The epithelial cells of this region show a very marked tendency to undergo mucoid changes; in some places, particularly on the lower lid, the superficial cells have all become mucoid. Stained with a specific stain for mucin (Figure 4) they make a striking picture. The mucoid cells when near the surface discharge their contents in thread-like masses and when the mucin is among masses of desquamated cells it appears to hold them together. Over much of the surface of this region of the con-

FIG. 4.—Showing mucoid cells in conjunctiva in blepharo-conjunctivitis due to Bacillus of Morax-Axenfeld

FIG. 5.—Epithelial ingrowth at limbus.

junctiva one finds desquamated cells apparently adhering to the underlying epithelial cell layer by means of mucoid shreds which have been thrown out from mucoid cells, the cell bodies of which retain their places in the epithelial cell layer. Among the free desquamated cells, and among those desquamated cells spoken of as adhering to the underlying epithelial cell layer by means of mucoid shreds, there are many Morax-Axenfeld diplobacilli, some cocci, and some Gram positive diphtheroid bacilli (Figure 5). Between the superficial cells of the epithelial cell layer occasionally one finds diplobacilli. The organisms within the epithelial cell layer *are rare and apparently do not penetrate deeply*, for in a search through many sections I did not find them below the second layer of cells. Many wandering cells—mostly mononuclear but a few polymorphonuclear—lie between the epithelial cells.

The subepithelial tissue of the transitional fold shows the same structure as that found in the similar lymphoid tissue of the region of the tarsal cartilage. The new cells form a diffuse mass, there being no localized masses of cells or follicles such as are seen in trachoma or follicular conjunctivitis. Plasma cells are the predominating cells. In the subepithelial tissue I did not find bacteria.

In the glands of Krause there are many plasma cells in the supporting tissue; this probably is pathological. Some of the epithelial cells of the ducts of these glands show mucoid change.

The conjunctiva of the ball shows the same increase of cells in the epithelial cell layer that exists in that of the transitional fold. There is the same marked desquamation of cells, but a much less tendency to form mucoid cells, there being no mucoid cells in the region near the cornea. One sees the same condition described in a foregoing paragraph of the apparent adherence of desquamated cells caused by shreds of mucoid material discharged from goblet cells which retain their position in the epithelial cell layer. Among these desquamated cells along the surface of the epithelial cell layer there are Morax-Axenfeld diplobacilli. Between the superficial cells of the epithelial cell layer there are diplobacilli. There is diffuse infiltration of a lesser degree of the subepi-

thelial tissue by new cells, these cells being of the same type as those found in the similar tissue in the region of the tarsal cartilage.

In the limbus region in one eye (the tissue of the other eye was imbedded in paraffin and in separating the conjunctiva from the cornea the incision unfortunately was made at the limbus, rendering this part of the tissue useless for study) along the greater part of the upper half of the cornea, the epithelial cells have multiplied and formed ingrowths in the underlying subepithelial tissue. These epithelial ingrowths vary in size and might be spoken of as having a neck and branches, the neck being the region near the surface, the branches being masses of cells lying in the episcleral tissue (Figure 6). The drawing is typical of what is found. The necks of these ingrowths have a long and short diameter. In the ingrowth shown in the drawing at the left there are in the short diameter about fifteen cells, in the long diameter the neck can be followed through twelve sections averaging in thickness about twenty microns. At the right in the drawing such an ingrowth is shown with the neck cut in the long diameter. The mass of epithelial cells in the middle of the figure shows a branch of an ingrowth; in this instance this mass of cells branches from the mass of cells shown at the left of the drawing and can be followed in the series through ten sections. Such masses of cells in a series eliminates the possibility of these formations being simply folds. The central cells of these ingrowths undergo changes, ultimately showing necrosis and in the necrotic areas there are polymorphonuclear leucocytes. The necrotic masses of cells may or may not be in contact with the surface. In the neck of one of these formations in the superficial cells I found diplobacilli. I could not find organisms in the deeper cells and I am of the opinion that organisms have nothing to do with the changes found in the interior of these masses of cells. The cells do not invade the scleral tissue and in no place do they infiltrate the tissue like malignant growths. The tissue surrounding them is cellular and fairly vascular.

The facts brought out in the foregoing study may be briefly summarized: In the lid edges there is an invasion of the deeper tissue by epithelial cells in the form of cone-like ingrowths;

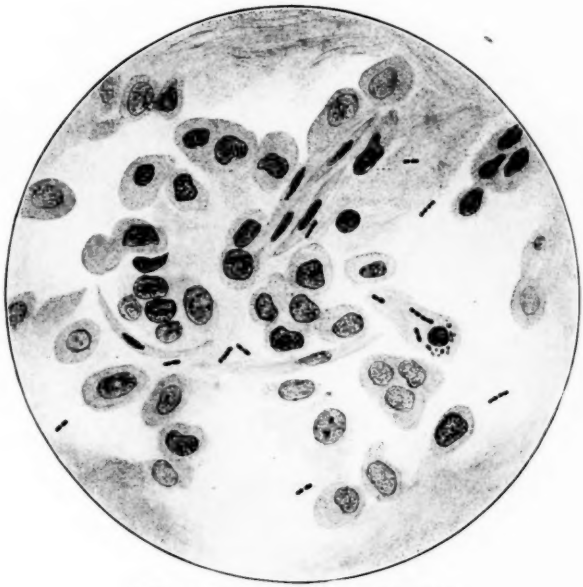

FIG. 6.—Bacteria in fold of conjunctiva.

the superficial pavement layer of cells is thinner than normal at the posterior edges of the lids and these cells do not show keratohyalin changes; the glands emptying on the lid edges are unaffected. The conjunctiva of the tarsus is much thickened and in it there are folds and tubules; there is great desquamation of epithelial cells and the epithelial cells show a moderate tendency to undergo mucoid changes; within the folds and tubules there are diplobacilli; there are diplobacilli between the superficial cells of the epithelial cell layer; wandering cells in large numbers are found between the cells of the epithelial cell layer; the subepithelial tissue of this region is fairly vascular and is the seat of a diffuse infiltration of new cells of which cells plasma cells are the predominating ones; no bacteria are found in the subepithelial tissue. The epithelial cell layer of the transitional fold shows a great increase in cells and the cells show a very marked tendency to undergo mucoid change; there is marked desquamation of cells but at no place is there complete desquamation of cells as in some other forms of conjunctivitis; desquamated cells and debris appear to be held in contact with the epithelial cell layer by means of mucoid shreds which remain adherent to mucoid cells which in turn hold their position in the epithelial cell layer; in this debris and other debris in the folds of the conjunctival sac there are Morax-Axenfeld diplobacilli; between the superficial cells of the epithelial cell layer there are Morax-Axenfeld diplobacilli; the subepithelial tissue of this region is like that of the similar region of the tarsus. The epithelial cell layer of the ball shows a moderate tendency to undergo mucoid change; along the surface debris adheres as on the surface of the conjunctiva of the transitional fold and in this debris there are Morax-Axenfeld diplobacilli in abundance; between the superficial cells of the epithelial cell layer there are diplobacilli; the subepithelial tissue of this region is like that of the similar region of the tarsus but much less involved. At the limbus in the episcleral tissue there are epithelial cell ingrowths which show necrotic areas.

On comparing Stock's findings and the foregoing it is seen that so far as the work of Stock goes the findings in this tissue confirm his in every point; on the findings which are similar comment is not necessary. In such a comparison it is also

seen that this tissue carries us several steps further in our knowledge of the histopathology of this disease.

Stock did not find bacteria in his tissue, attributing this to the process of preparation. The finding of the bacteria in my tissue settles this point and shows that the organisms are in the folds of the conjunctiva in masses of debris, and along the superficial surface, again in debris consisting of desquamated cells, which appear to be held in contact with the conjunctiva by mucous shreds, and shows that, in small numbers, diplobacilli lie in the interspaces between the most superficial epithelial cells of the conjunctiva; they are not found among the deeper layer of cells. I think it is a matter of practical interest that debris consisting of desquamated cells, mucus, bacteria, etc., appears to be held in contact with the conjunctival surface by mucus which is adherent to mucus goblet cells and that such debris is held together in masses by mucus when not adherent to the conjunctiva. It has been suggested that mucus has a protective function and that it may be even bactericidal. In this tissue appearances indicate that it may promote trouble by holding debris together and even in contact with the conjunctiva.

Stock speaks of the new cells found in the mucosa as round cells. Mayou, who has recently studied pieces of tissue removed from the lower conjunctival sac in several cases of this disease, points out the fact that Stock did not demonstrate the character of these cells by means of cytoplasmic stains. Mayou, using Pappenheim's plasma stain, found in his tissues that the new cells of the subepithelial tissue consist almost entirely of plasma cells. It is my good fortune to possess several sections of Stock's tissue and in a section stained with hæmatoxyloneosin it is perfectly clear that the new cells of the mucosa are mostly plasma cells (Stock's Rundzellen). I stained many sections with Pappenheim's stain and with Unna's polychromemethyl blue and my findings confirm those of Mayou.

Mayou in writing of the cells of the subepithelial tissue says that "directly beneath the epithelium the cells are somewhat broken up no doubt owing to the presence of the toxin." My tissue does not confirm this finding.

The finding in this tissue of evidence of involvement of the

glands of Krause, which Stock does not speak of, is worthy of attention and becomes of much interest when considered together with the well-known clinical fact of the difficulty met with in eradicating the organism from the conjunctival sac. Krause's glands, because of their comparatively long ducts, are removed from the action of remedies applied in the conjunctival sac, and as this infection is not a self-limiting one, infection of these glands may be persistent and be a source from which reinfection of the conjunctival sac occurs. Favoring this idea are the facts that in my tissue the organisms do not penetrate the conjunctiva beyond the second layer of cells and that the folds and tubules of the tarsal conjunctiva in which I found diplobacilli are shallow and accessible to remedial agents.

The tubular glands of Henle have been the object of much discussion, their existence being granted by a number of observers and denied by others. I would again point out the fact that I made sections of the conjunctiva on the flat surface and these sections leave no doubt in my mind about the existence of tubules in this tissue.

The finding of ingrowths of epithelial cells at the limbus and the necrosis of these cells is by no means the least interesting result of the study of this tissue. One should proceed most cautiously in arriving at conclusions from the study of one case, but this tissue seems to justify the idea that here we have explained one mode of origin of a fairly frequent complication of this and other forms of chronic conjunctivitis, viz., circumcorneal so-called catarrhal ulcers. The cause of the circumcorneal ingrowths was undoubtedly the same factor, probably the toxin of the organism, which caused the very similar formations in other parts of the tissue. The necrosis of the central cells, as I said above, was probably a part of the life history of the cells. As a result of the necrosis of the cells of these ingrowths we have clinically an ulcer, histologically a cyst-like formation. To answer the question which naturally arises, Why do the epithelial cells of the limbus form such ingrowths and the other cells of the bulbar conjunctiva not do likewise? we have the fact that these cells are active under all stimulations; for example, they have been found to be the most active cells in repairing injuries of the

epithelial layer of the cornea. In the light of this finding it is interesting to recall the fact that the efforts made to explain the circumcorneal ulcers of chronic conjunctivitis on the basis of traumatism and subsequent infection have been unsuccessful.

REPLACEMENT OF INCARCERATION OF THE IRIS BY TRACTION FROM WITHIN THE ANTERIOR CHAMBER.

By Dr. P. CHALMERS JAMESON, Brooklyn, N. Y.

IN the Archives of Ophthalmology, September, 1907, Dr. John Dunn reports a case of incarceration of iris, operated upon in 1903, in which replacement was accomplished by a large peripheral corneal section and traction with the spatula, on the iris, after its introduction into the anterior chamber. The incarceration was of three days' duration, large in size, and the procedure was attended with excellent result and left no deformity.

On April 13, 1907, the writer, assisted by Dr. Pafford, operated on William Q., at the Brooklyn Eye and Ear Hospital, for a prolapsed and strangulated iris, by this method, with success. The accident occurred early in the afternoon and the child was operated upon the same night at 10 P. M. The prolapse, which was large, was extruded through and strangulated in a small wound, midway between the anterior pole and corneal circumference. The strangulation of the iridocele made it difficult, if not impossible, to replace the iris from the outside without lacerating both it and the lip of the corneal wound. Notwithstanding the short period which had elapsed since the injury, the swollen tissue and exudate held the iris constricted almost immovably in the wound.

The technique adopted for replacement did not differ markedly from that of Dr. Dunn. After carefully cleansing the prolapse, a small incision with a Beers knife was made at the sclero-corneal junction, just large enough to admit a blunt iris hook into anterior chamber farthest away from and opposite to the pupillary border of the prolapse. This was swung around the constricted neck of the iris and gentle traction within the anterior chamber, in the direction of corneal incision, supplemented by moderate manipulation

outside, brought the iris into place. With a Lippincott irrigator the anterior chamber was cleansed with normal salt solution, the flow being from corneal incision to central wound. A four-grain solution of pilocarpin was used for twenty-four hours, followed by atropin. The eye made a perfect recovery, the iris assuming its normal function and appearance within two weeks, when it was presented to the Brooklyn Ophthalmological Section.

In addition to the advantages mentioned by Dr. Dunn, in his advocacy in selected cases of this method of traction from within the anterior chamber, in replacing incarceration of the iris, the writer would add the following suggestions in its favor:

I. The method enables one to substitute moderate traction from within the anterior chamber, for what must sometimes be damaging pressure to the iris on the outside.

II. It preserves to the greatest degree the edges of the corneal wound from instrumental injury in replacement.

III. It calls into use two efficacious physical forces in replacement, instead of one, namely, slight manipulation from without, and traction from within the anterior chamber.

IV. The peripheral incision of the cornea diverts the flow of aqueous from the direction of the corneal wound, thus lessening the danger of secondary prolapse; and the equalization of aqueous pressure on the cornea by peripheral incision permits the lips of the wound to approximate and coapt more thoroughly, inviting quicker closure, thus furthering the healing process.

V. It permits of more complete and thorough irrigation of the anterior chamber after replacement.

ON RHINOGENOUS OPTIC NEURITIS.

By Dr. MARC PAUNZ, Budapest.

Translated from the German Edition of these Archives, Vol. LXI., No. 4, by Dr. Percy Fridenberg, New York

THE etiological importance of accessory sinus suppuration in the causation of orbital cellulitis is generally recognized, and post-mortem examination has shown that thrombosis of the cavernous sinus, appearing under the guise of a severe, inflammatory exophthalmos, and generally ending fatally, may be due to empyema of the sphenoid sinus. Optic neuritis due to orbital cellulitis is well known, but the fact has been overlooked that purulent inflammation of the ethmoid cells and sphenoid sinus may lead directly to neuritis, particularly of the intracanalicular portion of the nerve, without this intermediary. Berger and Tyrman, Zuckerkandl, Onodi, and others have demonstrated the intimate anatomical relations between the optic canal and the posterior ethmoidal cells as well as the sphenoid sinus, but ophthalmologists have paid scant attention to this subject until quite recently. The older literature contains an interesting indication of a recognition of the connection. Beer (1817), who knew quite well that frontal sinus suppuration was a source of danger for the eye, has a special chapter: "On Vicarious Blindness from Suppressed Snuffles, without Evident Accumulation of Mucus in the Frontal Sinus," and writes that the recognition of this form of amaurosis (schwarzer Staar, literally, black cataract) is greatly facilitated by a history of a severe and suddenly suppressed "cold in the head," immediately preceding the ocular complication. In discussing treatment, Beer notes that the cases all do well if one is able to re-establish a copious discharge of mucus

from the nose, so that this form of amaurotic amblyopia (amaurotische Gesichtsschwaeche) offers an exceptionally favorable prognosis. There is no doubt in my mind that Beer had to deal in these cases with an acute retrobulbar neuritis due to pus retention in some one or other of the posterior accessory sinuses. The French ophthalmologists have for quite some time paid attention to the factor of nasal disease in retrobulbar neuritis, but the German literature contains few references to this point. Berger, in discussing the affections of the sphenoid sinus, calls attention to the fact that an ordinary cold in the head (rhume), if it spread to the sinus, may endanger vision, and attributes cases of acute retrobulbar neuritis to catching cold. A perineuritis is set up within the optic canal, and loss of vision rapidly develops. The acute form of retrobulbar neuritis is generally unilateral, but double involvement with sudden amblyopia or amaurosis has been observed, one eye always being attacked after the other. According to De Lapersonne, unilateral retrobulbar neuritis points to an empyema of the sphenoid sinus. A bilateral involvement is occasionally seen. Vision is generally much reduced, even to the point of complete blindness with the picture of optic nerve atrophy. Contraction of the visual field and scotoma cannot always be demonstrated. Schmidt-Rimpler admits the possibility of such an interdependence of accessory sinus and optic nerve disease, without going into the subject further. Fuchs notes the importance of a rhinological examination in cases of acute retrobulbar neuritis which have been attributed to catching cold. Birch-Hirschfeld thinks that optic nerve affections due to accessory sinus disease are more common than has generally been supposed, and lays stress on careful examination of the visual field and on the diagnostic importance of the early appearance of a central scotoma.

The following six cases were observed at the Eye-clinic of the University of Budapest:

1. Hemorrhagic papillitis and acute retrobulbar neuritis, O. D. Suppuration in posterior ethmoidal cells, right side.

Female, aged twenty-three years. Pain in right eye, of two weeks' duration. V. O. D. = $\frac{1}{50}$. V. O. S. = $\frac{6}{6}$ (?).

No coryza. Pain is elicited when the globe is pushed back into the orbit. Tenderness over right lamina papyracea. Visual fields normal. Almost circular paracentral scotoma, O. D., leaving a lower nasal sector free. Red-green color scotoma. The disk is inflamed and shows a blood streak in the upper temporal quadrant. Resection of right middle turbinal, and evacuation of the anterior and posterior ethmoidal cells, which contained pus. Vision promptly improved. Three months after operation, V. O. D. = $\frac{1}{1}$. Normal field. Scotoma still persists. Disk somewhat discolored and cloudy, some pigment deposits and choroidal changes toward the nasal side. No trace of sinus suppuration.

2. Acute papillitis and retrobulbar neuritis, O. D. Acute rhinitis and posterior ethmoidal sinusitis, R.

Female, aged twenty-three years. Coryza one month ago, lasting two or three weeks. Since then loss of vision right eye and pain in orbit and temple. V. O. D. = $\frac{1}{10}$, N. C. No limitation of field. Central color scotoma, absolute for blue, relative for red. Right disk swollen and blurred. Arteries narrow, veins distended. Slight ptosis. Globe and lamina papyracea sensitive to pressure. Right middle turbinate much swollen. No pus to be seen. Cocain-tonogen applied to middle meatus. Next day, patient reports that a copious mucopurulent discharge from the nose followed this examination and that vision had improved. V. O. D. = $\frac{1}{30}$. Fundus, as before. Several days later, after resection of the middle turbinal, the posterior ethmoidal cells were opened up. The mucous membrane was found much engorged but there was no pus to be seen. No discharge from sphenoid sinus. At time of discharge, five days later, fundus as before. V. = $\frac{1}{5}$ (?). Three days later, V. = $\frac{1}{5}$. Disk somewhat clearer, vessels normal. No paracentral scotoma but relative central color scotoma persists.

3. Acute retrobulbar neuritis, O. U. Papillitis, O. S. Hypertrophied middle turbinate, R. Polyp, L.

Male, aged thirty-nine years. Syphilitic infection five years previously. Of late has had severe headache lasting for weeks. No coryza. V. O. D. = $\frac{1}{30}$. O. S. = $\frac{1}{1}$. Within a few days vision fell to O. D. bare perception of light, O. S., fingers at one metre. No evidence of lues or toxic disease. O. D., pupil dilated, sluggish to light. O. S., normal. The fundus of the right eye shows venous hyperæmia, and some clouding of the disk. Left disk grayish, cloudy, and swollen. Veins, tortuous. Marked contraction of upper nasal and lower temporal quadrant of left field. Central color scotoma. Right nares swollen; middle

turbinal much enlarged. Broad polypoid hypertrophy in left middle meatus. No pus. Transillumination of antrum shows both sides clear. A series of inunctions had no effect on vision. The nasal polyp was then snared off, the anterior portion of the middle turbinal resected, and the anterior and posterior ethmoidal cells freely opened. No pus found. Similar operations on the left side failed to reveal any suppuration. No sphenoidal discharge. Immediately after this operation patient claimed that he could see. V. O. D. = light perception. V. O. S., fingers at three metres, rising to $\frac{5}{60}$ (?) that afternoon. Within the next ten days vision improved to $\frac{1}{5}$. The left fundus still showed a slight clouding, and the patient claimed that there was some blurring of the sight of the right eye. Fields normal.

4. Chronic retrobulbar neuritis with papillitis, O. U. Empyema of maxillary, ethmoid, and sphenoid sinuses, L.

Female, aged twenty-six years. Diminution of vision since four months. No history of coryza. Amenorrhœa of six months' duration. Pupils normal. Disks somewhat blurred, with pallor of temporal halves. Arteries narrow. V. O. D. = fingers at two metres; + 1D. = $\frac{5}{10}$. V. O. S. = $\frac{5}{10}$, N.C. Concentric contraction of both fields. Central color scotoma. Congestion of both nares. Creamy pus discharge from left. Left antrum dark on transillumination. A large amount of pus was evacuated from the left ethmoidal cells and discharge continued from them and from sphenoid. Several days later the left antrum was opened through the canine fossa under ether, and was found to contain green fetid pus. Freely curetted and wide communication with the middle meatus established. A few days later, vision had risen to O. D. = $\frac{5}{30}$. O. S. = $\frac{5}{10}$ (?). Seven weeks later the color scotoma had disappeared and V. O. D. = $\frac{5}{15}$. V. O. S. = $\frac{5}{10}$. Fundus, as before.

5. Retrobulbar neuritis, discolored disks, O. U. Chronic ethmoidal and sphenoidal suppuration, L.

Female, aged fifty-six years. Caught cold a week ago, and vision began to fail. In a few days she was blind. No history of coryza. Denies specific disease. Intense headache a few days ago. Pupils dilated; do not react. No perception of light. Media clear. Disks gray and blurred. No pain on pressure of globe. Dry crusts in both nares. Left lower turbinal atrophic, middle turbinal shows chronic thickening. Pus flows from olfactory fissure after removal of crusts, coming from posterior ethmoidal cells and sphenoid sinus. Like conditions found on left side. Antrum clear on both sides. Resection of middle turbinal and

evacuation of posterior ethmoidal cells on both sides had no effect on vision, and a series of inunctions was just as ineffectual. Discharged unimproved. Both disks grayish white; outlines blurred.

6. Acute retrobulbar neuritis, O. U. Ethmoidal suppuration, R. and L.

Male, aged forty-five years. Blurring of sight four days ago, much more marked next morning. By night he had become blind. No history of coryza. Denies lues. Indulges moderately in alcohol and tobacco. Pupils dilated, immobile. Media clear. Fundus normal. No perception of light. Region of frontal tender to percussion. Pressure pain over supraorbital fissure, but none over lamina papyracea. Physical examination, negative. Pus discharge from anterior ethmoidal cells, left. Antra clear. Operative evacuation followed by free discharge of pus. No pus found on right side. Next day there was bare perception of light by both eyes. Four days later vision had improved to O. D. = fingers at $\frac{1}{2}$ metre. O. S. = fingers at $2\frac{1}{2}$ metres. Color blind for red and green. Paracentral color scotoma. Vision then again fell, and the ethmoidal cells were again opened on both sides. Vision then improved steadily and in a month was normal in the right eye, in the left. Fields normal. No color scotoma. Pus discharge still continues from both nares, but patient refuses further operative intervention.

A study of these cases shows the intimate connection between the affection of the optic nerve and the existent nasal suppuration. Disease of the internal organs and of the nervous system as well as systemic intoxication was excluded in all but Case 3, in which there was a history of syphilis, but no evidence of actual specific disease. It is to be noted that a series of inunctions in this case had a decidedly bad effect on vision which increased with surprising rapidity only after operation on the diseased accessory sinuses. In Case 6, there was a possibility of lead intoxication, although the acute retrobulbar neuritis spoke against it, but in this case again there was no sign of chronic plumbism. The first two cases are typical of the one-sided acute retrobulbar neuritis, the nasal origin of which was soon recognized by the French authors cited above, coming on rapidly with severe pain in the orbit and temple, and tenderness over the lamina papyracea. Pus retention in the posterior accessory sinus was

demonstrated beyond a doubt, and its evacuation was followed by rapid and complete recovery. Double retrobulbar neuritis was noted in Cases 3 and 6, in one of which no pus was found, while in the other there was an involvement of the accessory sinuses of both sides. Case 4 shows bilateral chronic retrobulbar neuritis, going on to atrophy, which had been caused by unilateral empyema of the sinuses. This had evidently begun in the antrum, by buccal infection through diseased tooth cavities, and then spread upwards to the ethmoidal and sphenoidal sinuses. A complete cure was not effected until the antrum had been cleaned out by a radical operation. In Case 5, the neuritis was probably due to an old sinus suppuration which was overlooked until the patient began to go blind. The disks were then pallid and it was impossible to stop the optic nerve atrophy.

Papillitis was found in both unilateral cases (1 and 2); descending atrophy in Cases 4 and 5, both of which were due to chronic sinus suppuration. In one case (6) there were no fundus changes. In one case (3) there was papillitis with marked venous stasis, but no sinus suppuration could be detected. Vision failed rapidly, generally in a few days, except in Case 4, and two patients (5 and 6) were brought into the clinic blind. In one case (3) sight in the right eye was completely and nearly lost in the left while the patient was under treatment. Central and paracentral color scotoma was found in five cases, no functional examination being possible in Case 5. In one case (6) color vision first returned at the centre and later at the periphery of the field. In three cases there was more or less marked concentric contraction of the field of vision.

As to the causal factor of nasal disease, only one case of acute retrobulbar neuritis (2) could be attributed to a recent coryza. One patient (5) claimed that her blindness followed a cold, but her nasal trouble was an undeniably chronic suppuration. In one case (1) examination aroused suspicion of pus retention, but the patient was not aware of having had snuffles. In two cases (4 and 6) with manifest pus retention in the accessory cavities, the patients claimed not to have been troubled with colds. and did not even complain of the pus which was present in large amount in the

nose. In one case (3) there were polypoid hypertrophies but no pus. The evanescent headaches had probably been due to accessory sinus empyema which was evacuated spontaneously.

In two cases (1 and 2) acute unilateral suppuration of the posterior ethmoidal cells was demonstrated in connection with acute retrobulbar neuritis of the same side, and in another (6) bilateral ethmoidal suppuration had caused an acute involvement of both optic nerves. In one case (5) there was chronic bilateral suppuration of ethmoid and sphenoid, and in another (4) chronic unilateral involvement, leading in both cases to disease of both optic nerves. It was not always easy to determine whether the sphenoid sinus was involved in cases of posterior ethmoidal suppuration. This is however usually the case, as is the combination of frontal sinus and anterior ethmoidal cell suppuration. The operative procedures indicated are the same, in either event.

The dependence of optic neuritis on disease of the posterior accessory sinuses is made intelligible by the specimens of Onodi and Zuckerkandl which show the intimate anatomical relations between these spaces and the optic canal. Disease of the posterior ethmoidal cells causes neuritis more often than does sphenoid sinus suppuration. The intracanalicular portion of the nerve is generally first involved, and Onodi has shown that the canal may run through the sphenoid sinus or a posterior ethmoid cell; the bony wall being as thin as paper. It is rather remarkable that there was no orbital cellulitis in a single one of our cases. The color scotoma, too, shows that the optic nerve is the main seat of the trouble. There was, it is true, no post-mortem, and as these cases rarely end fatally, however frequently they may lead to complete blindness, pathological demonstration of the lesion will be attended with difficulty.

The inflammatory process probably spreads exactly as it does in orbital or cranial involvement. Congenital dehiscences in the bony walls may play a part, but it is more probable that blood-vessels and lymph-channels are the main pathways, and that osteophlebitis, periostitis, and perhaps bone necrosis are the most important contributing factors. It is to be noted that throughout the course of the optic canal the periosteum is replaced by an extension of the

dura, the optic nerve sheath, and that a small amount of pus collecting between this sheath and the bony wall of the canal would suffice to cause compression or inflammation of the nerve. This would account for the marked and rapid loss of vision which is so characteristic in these cases.

As to the path of infection in individual cases, the clinical evidence is incomplete. De Lapersonne thinks that sphenoid sinus suppuration generally causes œdema of the nerve; a canalicular neuritis or perineuritis (Berger). The clinical course of the optic nerve affection may aid us in a differential diagnosis between collateral œdema and true neuritis. Neuritis developing rapidly and subsiding promptly without permanent impairment of function and without lasting fundus changes, would speak in favor of simple compression or collateral œdema. True optic neuritis, on the other hand, might well be inferred, where we have ophthalmoscopic signs of degeneration, permanent impairment of vision, and defects or contraction of the visual field.

The detection of sinus suppuration and the prompt improvement of vision after its evacuation, explains some cases perfectly, but we are at a loss in others, where no pus was found, and yet vision improved after the nasal operation. The most decided improvement was found in just such a case (3). It is possible that still undetermined circulatory disturbances afford some clue. We know that the anterior and posterior ethmoidal arteries are branches of the ophthalmic artery, and that the ethmoidal veins are connected with the ophthalmic vein. We may conjecture that the free hemorrhage coincident with the nasal operation restores the balance of circulation which was disturbed in these areas. The good results can hardly have been due to chance, as they were most striking, and similar observations have been made by Fuchs-Hajek, Birch-Hirschfeld, and Albrecht-Muehsam.

Our experience demonstrates again that both acute and chronic inflammation and suppuration of the posterior accessory sinuses may cause acute or chronic optic neuritis or collateral œdema, which, like the nasal disease, may be bilateral or unilateral, although the latter may be unilateral and yet lead to double optic neuritis. Vision is rapidly diminished, especially in the acute cases, and may lead to complete

blindness in a few days. Color scotomata, which have no uniform type, are invariably found, and defects and contraction of the visual field are almost always present. Ophthalmoscopic examination generally shows venous stasis, papillitis, or signs of descending atrophy; it may, however, be entirely negative. The symptoms are sufficient to establish a diagnosis of retrobulbar neuritis.

Disease changes were invariably found in the nasal cavities, generally in the form of pus in the posterior accessory cavities. Evacuation of the pus was followed, with the exception of a single case, by marked improvement or complete recovery. Accordingly, the more acute the case, the better the prognosis, although it is to be noted that operative treatment was remarkably successful in a chronic case.

Our observations suggest, at least, the importance of a careful rhinological examination in future, in all similar cases. It is true that acute retrobulbar neuritis goes on to spontaneous recovery in many instances, but in a given case we cannot count on any such favorable termination. If the neuritis is demonstrably due to accessory sinus suppuration it is our duty, beyond a doubt, to go straight for the cause of the disease. Considering the present development of rhinology, this is not to be counted a difficult or dangerous task. It is hoped that the observations here reported will induce others with suitable material to verify the attempted solution of this most important problem. The author is indebted to Dr. J. V. Barlay and to Dr. Desider Békès for their kindness in making ophthalmoscopic examinations and tests of the ocular functions.

SOME RARE BACTERIOLOGICAL CONDITIONS IN ULCUS SERPENS.

By Dr. zur NEDDEN.

Translated from the German Edition, Vol. LII., by Dr. Matthias Lanckton Foster.

(*With appended Plate IV.*)

SINCE the contributions to the etiology of corneal ulcers by Gasparrini[1] and Uhthoff and Axenfeld[2], various bacteriological investigations have been made which have confirmed the work of these authors. Usually the pneumococcus has been found to be the excitant of the typical ulcus serpens, but occasional cases have been met with in which no pneumococci could be found. I do not refer to those forms of infectious keratitis which in spite of an occasional hypopyon present a very different clinical picture from ulcus serpens, I include only those corneal ulcers which clinically resemble ulcus serpens and yet are not due to infection with pneumococci.

The first case of this kind was reported by Uhthoff and Axenfeld[3] who found in a typical ulcus serpens a diplobacillus, probably identical with the one described later by Petit[4] as the diplobacillus liquefaciens. Petit obtained pure cultures of this diplobacillus from three cases of serpiginous ulcer of the cornea which differed from the ulcus serpens only in that they were not associated with pain and photophobia, that they developed gradually, and that they were not accompanied by iritis. The diplobacillus liquefaciens was also obtained by McNab[5] in two cases which did not present a serpiginous type and ran a benign course. Bach and Neumann[6] described a hypopyon-keratitis which presented the clinical picture of

Heubacillen im eitrigen Belag eines Ulcus serpens.
(1000 fache Vergr.)

VERLAG VON J. F. BERGMANN IN WIESBADEN.

ulcus serpens, although the only micro-organisms found were thick, short diplobacilli which did not liquidate gelatine and were pathogenic for the corneæ of rabbits. Krueger[7] also reported a case of typical ulcus serpens which was caused by a previously unknown, proteus-like bacillus. According to Gourfein[8], Friedlaender's pneumobacillus is also able to produce a serpiginous keratitis, but in two of his three cases there was in Axenfeld's opinion[9] no superficial extension of the ulcer and therefore these did not correspond to what is commonly understood as an ulcus serpens. Finally the diplococcus of Morax-Axenfeld has been ascribed as the cause of a creeping corneal ulcer in a few cases. Paul[10] stated that of twenty-seven corneal ulcers associated with hypopyon and iritis caused by diplobacilli, seven showed a transient resemblance to ulcus serpens. From these few reports it appears that most of the cases of ulcus serpens in which no pneumococci were found did not present the typical picture of this disease. Only the three cases reported by Uhthoff and Axenfeld, Bach and Neumann, and Krueger, with perhaps one of Gourfein's, can be pronounced true cases because they exhibited a superficial serpiginous condition throughout their course.

In the systematic bacteriological investigations of the inflammatory affections of the conjunctiva and cornea which we have carried on for many years at Bonn, we have met with some cases of ulcus serpens in which no pneumococci could be found. In order to exclude as far as possible all sources of error we have made cultures with different media so that growth was rendered possible for all kinds of bacteria, even those most difficult to cultivate.

We found one case in which the diplobacillus of Morax-Axenfeld was exclusively present. But this one case in no way suffices to determine an etiological connection. When we consider that throughout the region of the Rhine the conjunctivitis due to this diplobacillus is every extensive among the poorer people we are obliged to think that if it was pathogenic for the cornea it would be met with more frequently in corneal ulcers, particularly in traumatic cases. I have mentioned in a former paper[11] that in almost all cases of ulcus serpens caused by pneumococci great quantities of diplobacilli would be found in the ulcer if a conjunctivitis due to

them was present at the same time. Diplobacilli were also found under the same conditions in little infiltrates in the margin or the more central parts of the cornea, but we were never convinced that they displayed a marked pathogenetic affinity for the corneal tissue. As a result of a conjunctivitis due to diplobacilli, and also of other forms of infectious conjunctival catarrh, in scrofulous persons, phlyctenulæ sometimes appear at the limbus and disappear in a short time, while the vascularization, infiltration, and ulcers which have resulted therefrom remain longer. When such patients come under treatment after the affection has lasted some time it may easily seem as if the diplobacilli had been the direct cause of the corneal trouble because the phlyctenulæ are no longer to be found. But of all the cases in which phlyctenulæ, trachoma, and other complications play a part there remain out of our very large number of cases of diplobacillus conjunctivitis, which amount to about four hundred a year, only a very small number in which it appears to be possible that the diplobacillus infection might be the direct cause of the keratitis. When these few cases are correctly investigated by cultures other kinds of bacteria are found which may be etiological. Under these circumstances it seems questionable whether the diplobacilli were the cause in this case of ulcus serpens in which they alone were found. We rather incline toward the view that the true cause escaped the investigation, perhaps because the ulcer had passed its height and showed a tendency to repair.

According to Petit, who found diplobacilli in eighteen cases of corneal ulcer in which the symptoms on the part of the conjunctiva were not well marked, and also according to Paul, there is no doubt that diplobacilli may cause severe inflammation of the cornea in many regions, but I must insist that it is not proven that such is the case in the country of the Rhine, and therefore it appears that the susceptibility of the cornea to this infection is not everywhere the same. Possibly this disease has lost a portion of its virulence in the western provinces of Germany as a result of its existence there for many years in endemic form.

I have very frequently found[1,2] the bacillus of infectious marginal ulcers in traumatic keratitis. This bacillus has a

marked pathogenic action on the cornea, both of men and animals, is able to spread from the conjunctiva to the cornea and produce marginal ulcers without any previous traumatism, and in cases of injury to create a clinical picture which transiently resembles that of ulcus serpens. Yet usually the characteristic virulent, serpiginous extension of the latter is absent. Such ulcers may be mistaken at the first glance for ulcera serpentia, but will be differentiated by their course. This differentiation is of importance regarding the treatment as the use of the pneumococcus serum is not indicated in these affections and operative treatment is also rarely needed.

In contradistinction to these cases which only occasionally exhibit a certain similarity to ulcus serpens we have observed three of those rare cases which show a true serpiginous character throughout their clinical course and are therefore properly designated ulcus serpens although no pneumococcus infection can be demonstrated. As the exact knowledge of the etiology of corneal ulcers has become important since the introduction of pneumococcus serum in the treatment of ulcus serpens it seems proper to give special attention to the ulcera serpentia in which pneumococci are wanting.

CASE 1.—C. H., forty-two years old, married, had always had good eyes. December 12, 1904, pain began in his left eye without known cause. Inflammation soon appeared on account of which he sought the clinic on December 15.

No lachrymal trouble. Left eye photophobic, conjunctiva injected, an ulcer *2mm* broad in the lower outer quadrant of the cornea with infiltration of the surrounding tissue. Margin of ulcer toward the centre of the cornea very cloudy. Small, barely perceptible hypopyon. Pupil small, several posterior synechiæ which yield to atropin. Right eye normal.

December 20.—Ulcer larger in every direction. Inner margin undermined. Floor of ulcer covered with whitish pus which can be removed easily. Hypopyon *1mm* high. Pain severe.

December 22.—While the ulcer has not become much larger the infiltration has extended markedly toward the centre of the cornea.

December 23.—Ulcer has extended upward. Broad semicircular infiltration toward the medial side in which can be seen several radiating lines.

December 25.—Margin of ulcer extended inward, down-

ward, and upward. Hypopyon greater. Pain increased. As the treatment hitherto employed, atropin, antiseptic collyria, and warm moist applications, had not been effective, Saemisch's incision was made. The hypopyon disappeared. The anterior chamber quickly reformed.

December 26.—No pain. Aqueous clear. Ulcer at a standstill. From this point recovery was uninterrupted and the patient was discharged January 6, 1905, with the eye quiet, a white scar in place of the ulcer, no synechiæ, and vision ½.

This ulcer was exactly like an ulcus serpens, but the bacteriological examination revealed on the slides only xerosis bacilli and quantities of round cocci which lay sometimes in pairs but usually in large heaps, with no capsule which could be detected. They were not stained by Gram's method.

By cultures xerosis bacilli and streptococci alone were found. The latter micro-organisms showed the characteristics of true streptococci on re-inoculations in various nutritive media and were doubtless identical with the cocci found in the coating of the ulcer. No pneumococci were found. The differences between the cultures obtained and those of pneumococci were too great for a mistake to be possible.

The clinical pictures in the two following cases were similar, but the bacteriological examination gave a very different result.

Case 2.—H. E., twenty-eight years old, stone mason, had his left eye injured March 18, 1904, by a flying bit of stone. Two days later the eye became inflamed and soon grew worse. On March 30 he came to the clinic.

In the lower inner quadrant of the left cornea was a round, superficial ulcer 1.5*mm* broad, surrounded by a sharply defined infiltration varying irregularly from 2 to 3*mm* in width. There was marked photophobia and ciliary injection. No lachrymal trouble. Occasional severe pain. Pupil fairly dilated. Small hypopyon 1*mm* high. Right eye normal. Treatment, atropin, moist warm applications, and frequent cleansing with a weak solution of oxycyanate of mercury.

March 31.—Worse. The ulcer is spreading slowly outward while the medial portion is beginning to clear up.

April 1.—The lateral margin of the ulcer is more infiltrated and is clearly undermined. About it is an active diffuse cloudiness in which can be seen by means of the loupe radiating striæ in the middle and deeper layers of

the cornea. The hypopyon has increased. Severe pain. Saemisch's operation was performed.

April 2.—Ulcer no longer progressive. The undermined margin has given way. No pain. Uninterrupted recovery now took place and the patient was discharged May 11, with a dense scar in place of the ulcer, the pupil round, and the vision $\frac{2}{7}$.

CASE 3.—J. D., forty-seven years old, farmer. Patient states that he suffered several years ago from granular disease and since that time has often had lachrymation of his left eye. About the middle of October, 1904, an inflammation began in his right eye without known cause.

October 23.—Trachomatous cicatrices in the conjunctivæ of the upper lids. No lachrymal trouble. Marked ciliary injection and photophobia of the right eye. In the upper part of the cornea is an irregular ulcer *3mm* broad with a gray floor. The margin toward the centre of the cornea much infiltrated. Pupil contracted, dilates incompletely under the influence of atropin. Hypopyon *1.5mm* high. Treatment, atropin, moist warm applications, and cleansing with antiseptic solutions.

October 24.—Ulcer has extended downward *2mm*. Severe pain.

October 26.—Eye somewhat improved. The upper part of the ulcer is cleaner, below there is still an active infiltration. Hypopyon smaller.

October 29.—Severe pain. Ulcer has spread downward considerably since yesterday. The margin is undermined and the deeper layers of the cornea are very cloudy.

October 31.—Pain worse. Lower margin of ulcer much infiltrated and shows evident progression. Hypopyon greater. Cauterization of the progressive margin.

November 1.—Apparent improvement in the morning, recurrence of severe pain in the afternoon.

November 2.—Ulcer has extended downward. Hypopyon *4mm* high. Thick, gray exudate in the pupil. Some chemosis. Saemisch's keratotomy performed. Exudate could not be removed.

November 3.—Ulcer quiet, no pain. The ulcer then healed slowly and left an extensive cicatrix and circular posterior synechiæ, so that when the patient was discharged on December 4 the vision was reduced to perception of light. There was no fundus reflex and the projection was imperfect. After four weeks the margins of the scar had cleared up somewhat.

Both of these cases presented clinically the typical picture of an ulcus serpens. In the first the process was entirely superficial, while in the latter there was in addition

to the superficial progression an extension of the inflammation into the deeper layers of the cornea. In neither could pneumococci be found either in the material taken from the undermined margin of the ulcer, or in the scanty conjunctival secretion. As I repeatedly prepared culture plates, not only with the usual glycerin agar but also with human blood, and a mixture of ascitic fluid or rabbit serum with agar or bouillon, I have no doubt of their absence. Numerous colonies of the bacillus subtilis were obtained from material taken from beneath the undermined margins, usually without admixture with other kinds of bacteria. Occasionally a few colonies of xerosis bacilli and sarcinæ were present, but these must be ascribed to accidental contamination. In Case 3 the bacillus subtilis was obtained in large quantities from the conjunctiva also.

In order to render it more certain in regard to these microorganisms I made re-inoculations in various media by which I demonstrated that the stock cultivated from Case 2 was identical in its cultural peculiarities with the ordinary bacillus subtilis, while that from Case 3 presented some variations. Its growth in bouillon and the agar stab culture was scanty, which showed this stock to be aerobic. No growth was obtained in milk or on potatoes. It was also worthy of notice that the long threadlike formations, which are almost always found in the subtilis group, appeared characteristically only in the gelatine culture, while in the other media and in the pus of the ulcer they were absent, or rarely found. The remaining characteristics however indicated that this bacillus belonged to the subtilis group.

These bacilli were found in great numbers in the smears obtained from the undermined margins of the ulcers in both cases. They were rather more slender than those in the cultures, particularly those in the last case, of which I have prepared a photogram (Plate IV.). Consequently they bear a certain resemblance to the diplobacilli of Morax-Axenfeld, but can be differentiated by the staining with Gram's method. There can be no doubt that in both of these cases of ulcus serpens there was an infection with bacilli which belong to the group subtilis and that the two stocks exhibit some cultural differences.

It is only recently that attention has been paid to the bacillus subtilis in ophthalmic bacteriology. Every one who has done much work in this line has surely met with it frequently and it has usually been ascribed to contamination because this bacillus is widespread and commonly held to be

saprophytic. Haab[13] was the first to point out that the bacillus subtilis may cause suppuration in the human vitreous, although Poplawska[14] had shortly before found bacilli which resembled the subtilis in a purulent vitreous. Roemer[15], Baenziger and Silberschmidt[16], and Kayser[17] have likewise found the subtilis to be the cause of panophthalmitis in human eyes. Michalski[18] and Gourfein[19] have found this microorganism in a great number of cases of conjunctival catarrh and look upon it as the exciting agent. The former described it under the name bacillus subtiformis and observed it in thirteen cases during 1900. Afterward he found it in fifty similar cases, in forty-six without admixture with other pathogenic germs. Gourfein cultivated the bacillus subtilis seventeen times from the secretions in conjunctival inflammations which ran a distinct clinical course and were complicated in two cases by infiltration and ulcers of the cornea near the limbus. Both Michalski and Gourfein were able to reproduce the clinical picture in the conjunctivæ of rabbits by pure cultures and the latter also produced a rapidly spreading ulcer of the cornea with the same infection.

In view of such observations it is no longer doubtful that bacilli of the subtilis group occasionally develop pathogenic powers in different parts of the human eye, and it was to be expected that inoculations of the stocks taken from the ulcera serpentia would not be without effect on rabbits' eyes. The results obtained with each were the same except that the reactions obtained from the stock of the last case were in general more intense, doubtless because its virulence was the greater.

A culture applied to the conjunctival sac produced no reaction. A subconjunctival or subcutaneous injection of from 0.2 to 0.5*ccm* of a bouillon culture produced a small abscess which healed in two or three weeks. Pure cultures of the bacilli were obtained from the pus. Injection into the cornea of a drop of agar culture caused a severe purulent keratitis with an exudate into the aqueous when the more virulent stock was used, but although this keratitis showed a progressive character for the first eight days it had no resemblance to ulcus serpens. Injection into the anterior chamber and the vitreous produced a severe iridocyclitis with much exudation, which resulted in phthisis bulbi.

The intraperitoneal injection of guinea-pigs, and the intravenous injection of rabbits with 2 or 3*ccm* of a concentrated culture produced no pathological symptoms.

The bacilli could be cultivated from the exudate in the aqueous or the vitreous, and also from the subconjunctival and subcutaneous abscesses only three or four days before the inflammation had reached its height. To explain this we must either assume that the micro-organisms became spoiled, which is to be observed occasionally with other infections, or that the germs disappear partly through phagocytosis, partly through the early appearance of anti-bodies. The latter accounts for the cases in which the bacteria could no longer be found soon after the infection, while the first theory would explain why the bacilli cultivated from both corneal ulcers grew much worse and more slowly in artificial media during the first generation than afterward.

Baenziger and Silberschmidt made similar observations. They produced panophthalmitis by injections of pure cultures of subtilis into the vitreous of rabbits, yet could not obtain the bacilli from the pus in the vitreous after the lapse of three or four days. Roemer was unable to cultivate micro-organisms from his case, which according to the morphology and staining was one of subtilis. I was also unable to obtain cultures in another case, although Gram positive bacilli which resembled the subtilis were present in great quantities. The case was one in which the eye had been enucleated on account of iridocyclitis. Such observations show that the weakened cultural conditions of the stock of subtilis obtained from the last ulcer cannot be deemed remarkable. This peculiarity of the otherwise so easily cultivated bacillus subtilis should be considered.

Since the bacillus subtilis is occasionally pathogenic for various parts of the human eye increased attention must be given to its presence in all internal and external inflammations of that organ. Yet it must not be considered the pathogenic agent in all cases in which it is found, and it must not be expected that it will always produce an ulcus serpens when it infects the cornea. It can be assumed as certain only that under favorable conditions it may cause a severe keratitis with hypopyon and iritis which may clinically resemble the

ulcer produced by pneumococci. The same is true of streptococci, as shown by my first case, although the ulcers they produce have usually no serpiginous character.

In infection of the cornea the clinical appearances vary in the same manner as in infections of the conjunctiva, and the same clinical picture may be produced by different kinds of bacteria. Ophthalmia neonatorum may be produced not only by gonococci, but also by bacterium coli, staphylococci, pneumococci, and influenza bacilli, without any striking clinical difference. Even if the inflammations caused by the other bacteria have in general a more benign character than the gonorrhœal, yet on the other hand true gonorrhœal infection occasionally runs the course of a harmless conjunctivitis. It is exactly the same with ulcus serpens. The typical forms are for the most part produced by pneumococci, in rare cases by other kinds of bacteria, among which are, according to the experience of Petit the diplobacillus liquefaciens, the bacilli found by Bach and Neumann, Krueger's proteus-like bacillus, Friedlaender's pneumobacillus, and finally the bacillus subtilis and the streptococcus. Perhaps there are still other micro-organisms which are able to produce this clinical picture.

In the atypical forms of ulcus serpens a larger number of groups of bacteria are etiological, particularly the diplobacillus of Morax-Axenfeld and the bacillus of marginal ulcers, but it would be wrong to reserve the term "atypical ulcus serpens" for the cases in which there are no pneumococci, because, aside from the fact that typical ulcera serpentia not due to pneumococci would not be taken into account, it must be borne in mind that sometimes keratitis caused by pneumococci runs an atypical course.

Though the cases of typical ulcus serpens without pneumococci will probably remain very rare they must not be overlooked in the designation of the disease and therefore there is no justification in naming an ulcus serpens a pneumococcus ulcer from the clinical appearance without further investigation.

In conclusion it may be noted that in all three of our cases of ulcus serpens without pneumococci keratotomy was of excellent service and checked the progress of the disease, leaving two cases with round pupils and good vision. In the atypical

cases caused by diplobacilli non-operative treatment gave the better result, according to Paul.

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REPORT OF THE PROCEEDINGS OF THE OPHTHALMOLOGICAL SOCIETY OF THE UNITED KINGDOM.

By Mr. C. DEVEREUX MARSHALL.

An ordinary meeting of the society was held on Thursday, October 15, 1908, Mr. Marcus Gunn, President, in the chair.

Dr. Maitland Ramsay showed a **spectroscopic test of color vision,** Mr. Sydney Stephenson a case of **unilateral ptosis** treated by the Motais operation very slightly modified, Dr. A. Ogilvy showed microscopic sections from a case of **tuberculous iridocyclitis** in a man aet. 75, and Mr. Lawford exhibited a case of **bilateral traumatic choroiditis.** Mr. Hudson showed a case in which there was **oil in the anterior chamber,** and Mr. Wray one of **follicular conjunctivitis.**

Messrs. Frank G. Thomas and J. Herbert Parsons read a paper on a case of **Dipterous larva in the anterior chamber.** The case was that of a male, aet. 2¾ years, a native of Pembrokeshire, who was seen on March 18, 1908. 3½ weeks previously the left eye was noticed to be red and photophobic, and the child seemed occasionally to be in pain. There was no history of injury or illness, nor any symptoms suggestive of intestinal "worms." On examination under an anæsthetic the eye showed slight ciliary injection, cornea clear, anterior chamber deepened, and the aqueous faintly turbid. The iris was discolored and pattern fogged. The pupil was irregular, and filled with pigmented lymph. Lying on the iris was a long cylindrical body resembling a small worm, its head in the lower and outer quadrant and tail in the angle of the anterior chamber at the upper and inner quadrant. The body

consisted of 8 segments, and measured 12 or 13*mm*, was of grayish-yellow color, and showed no movements. With a binocular loupe a fine covering of gray material could be made out enveloping it and reflected on to the iris. The tension was −1, and the eye blind. Enucleation was performed the same day. The eye was hardened in formol and sections were made at right angles to the foreign body. The A. C. contained exudate in front of the iris, tying down the cylindrical mass to it: the lens was somewhat shrunken, and the vitreous was also shrunken and contained a coagulum. The retina was detached, with sub-retinal coagulum. Microscopically, the cornea was found slightly infiltrated at the periphery. The anterior chamber was deep and contained homogeneous coagulum, with multitudes of leucocytes. The angles were widely open, and the region of the canal of Schlemm was densely packed with leucocytes. Lying on the surface of the iris was a circular body bounded by hyaline membrane, which was clearly an animal parasite. The iris, ciliary body, and retina were densely infiltrated with leucocytes. The lens was distorted, showing cataractous changes, and covered by a fibrinous coagulum, the latter being also seen covering the ciliary body. The choroid was *in situ*, and practically normal. One section showed the head very beautifully, and this, with others, was submitted to Mr. A. E. Shipley, F. R. S., who thought the parasite was the larva of either the blow-fly, or of *Sarcophaga carnaria*, or *S. magnifica*. The ova of the blow-fly, or the larvæ of sarcophagidæ were sometimes deposited in the nasal passages and other channels leading outward in man, and also on the conjunctiva in purulent cases. It was suggested that the larva might work its way from the conjunctival sac directly through the thin sclerotic of a child into the interior of the eye, or if deposited in the nostril, might find its way by the nasal duct to the lachrymal artery and thence into the eye by way of the central retinal artery, or of one of the ciliary arteries. The possibility of this larva being that of *Hypoderma boris*, of which there were two recorded cases in man, and one in the horse, must not be overlooked since the larva of this fly was of necessity parasitic in mammalia.

The case was discussed by Mr. Parsons, the President,

MAJOR ELLIOTT, Mr. HEWKLEY, Mr. ORMOND, Mr. COATS, and Mr. POOLEY.

Mr. N. BISHOP HARMAN read a paper entitled **Six generations of piebalds.** He showed a chart of the pedigree of a family in which there was a striking and continuous inheritance of certain skin and hair markings. Some of the members of the family were shown at the meeting. The features were: a white forelock, a white patch of skin spreading from beneath this lock of white hair down the centre of the forehead, and in some cases patches of white skin about the trunk or legs. The white tissues were appreciably more delicate than the normal skin and hair. The color of the ordinary hair ranged from a light brown to a deep brown, almost black. There were no other abnormalities. The connections of this family had been ascertained for six generations: of these, four were living. The generations comprised 34 childships and 138 individuals. Of the childships, 9 showed the inheritance in direct descent. Mr. Harman considered the anomaly to be in the nature of a partial albinism. He discussed the nature of this family history in relation to the inheritance of disease by one or other sex, and to the law of inheritance as propounded by Mendel.

A meeting of the Society was held on Thursday, November 12th, Mr. R. MARCUS GUNN, President, in the chair.

The following card specimens were shown: Mr. R. R. JAMES: **Birth injury of cornea.** Mr. A. L. WHITEHEAD: **Specimen from a case of iridocyclitis followed by perforation of the sclerotic and orbital abscess.** Mr. SYDNEY STEPHENSON: **Crateriform hole in the optic disc.** Mr. RAYNER BATTEN: **Acute optic neuritis in one eye with macular changes in one eye.** Mr. LESLIE PATON: **Cataract developing subsequent to X-rays.**

Mr. A. L. WHITEHEAD read a paper entitled **A case of orbital abscess following retinal embolism.** The patient, a woman aet. 42, after an illness of ten days' duration, with elevation of temperature and pain in the right shoulder, suddenly lost the sight in one eye. This eye subsequently became acutely inflamed and proptosed, and an orbital abscess formed. The abscess was opened, and the eye excised: pus was found

to be exuding through a necrosed area of sclerotic. The axillary vein subsequently became thrombosed and suppurated. The absence of any primary focus of suppuration and the presence of a systolic mitral bruit rendered the diagnosis of infective retinal embolism, secondary to endarteritis, probable.

Mr. PARSONS, in comment on the case, drew attention to the importance of a bacteriological examination of the blood in such cases and showed, by narrating cases, that the behavior of the case varied greatly according to the particular organism responsible. There was also a strong selective factor as regards site in the case of various organisms. Mr. ANGUS MACNAB pointed out that in many cases where the abscess contents were afterwards found to be sterile the pneumococcus was the organism responsible. Mr. Whitehead replied. The pus from the eye was sterile, while that from the abscess contained some diplococci.

Mr. HERBERT H. FOLKER read a paper on **Nodular opacity of the cornea in three generations.** Twenty-five members of this family had been examined, and the opacity was found in nine of them. In the first and second generations, five were examined, and nodular opacity was present in three members. In these cases, in addition to the opacities, fine lattice-like lines were found in conjunction with them. This latter condition was absent in members of the third generation. The nodular opacities were fewer in number and less in density in the younger members. In all the cases the opacities appeared to be situated in the anterior layers of the substantia propria, the epithelial layer not being involved. No signs of syphilis or history of rheumatism were present in any of the cases. He was indebted to Dr. George Carter, of Tunstall, who first sent an affected member of the family to him, and who had taken great pains in assisting to trace the various members of the family.

The President remarked on the large amount of work done by the Society recently on the question of heredity. In only two cases had he seen nodular opacities of the cornea associated with raising of the epithelium. Mr. G. COATS described the histology of a case which he had examined. Mr. MACNAB remarked on the advantage which had accrued when

he shaved the cornea. Mr. HERBERT FISHER drew attention to some notes of a case of nodular keratitis which he showed three years ago. Mr. HOLMES SPICER also described cases and said he had scraped from them material which was found to be hyaline, with calcareous deposits in it. Mr. DOYNE, Mr. SYDNEY STEPHENSON, Mr. TREACHER COLLINS, Mr. INMAN, MAJOR ELLIOTT, Mr. BISHOP HARMAN, and Mr. NETTLESHIP and others also joined in the discussion, and Mr. Folker replied.

REPORT OF THE THIRTY-FIFTH MEETING OF THE GERMAN OPHTHALMOLOGICAL SOCIETY, AT HEIDELBERG, AUGUST 5–7, 1908.

REPORTED BY DR. K. WESSELY, BERLIN.

Translated from the German Edition of these Archives, Sept., 1908, by Dr. MATTHIAS LANCKTON FOSTER, New York.

FIRST SCIENTIFIC SESSION, WEDNESDAY MORNING, AUGUST 5TH. DOR (LYONS) IN THE CHAIR.

1. SCHIRMER (Strasburg)—**The innervation of the lachrymal gland.** Schirmer studied quantitatively and qualitatively the tears in three cases of old paralysis of the sympathetic and in three eyes before and after resection of the superior cervical ganglion, and also stimulated the peripheral end of the sympathetic with a weak and a moderately strong induction current immediately after the resection of the ganglion. He shows that the gland is not caused to secrete in this manner. The quantity of tears and their composition was perfectly normal in the cases of old paralysis. But in each of the fresh cases the quantity secreted during reflex stimulation was clearly less than before the operation while the concentration of the tears was unchanged. His conclusion is that the lachrymal gland is innervated by the sympathetic together with the facial and that the secretion of tears is influenced not by its action on the vessels, but through innervation of the gland cells.

2. V. MICHEL (Berlin)—**Buphthalmos and semilateral hypertrophy of the face.** V. Michel reports a large number of patients with semilateral hypertrophy of the face, both total and partial. In the pronounced cases not only the soft parts of the face but likewise the bony parts and the tongue and buccal mucous membrane were semilaterally enlarged or

thickened, while in the rudimentary cases only certain parts of one side of the face were hypertrophied, the upper lid forming the place of predilection. Anatomically, as demonstrated from excised pieces of the lids and of the buccal mucous membrane, the condition was that of a neurofibroma, that is the tumor-like thickenings were permeated by a rich network of nerves become enormously hypertrophic through proliferation of their peri- and endoneurium, which could frequently be felt externally as solid cords, especially in the lids. Buphthalmos was so often present on the same side that the author considers monolateral buphthalmos to be an accompanying symptom of semilateral hypertrophy of the face. The connection between the two diseases is not yet clear; the neurofibromata of the ciliary nerves occasionally found can hardly be considered alone the cause of the enlargement of the eye; the buphthalmos and the facial hypertrophy are rather to be looked upon as co-ordinate disturbances.

Discussion: SEEFELDER (Leipsic) said that in a great number of cases of monolateral buphthalmos he had never seen any signs of facial hypertrophy and had found no changes in the ciliary nerves.

3. M. v. HOFFMANN (Baden-Baden)—**Report of an interesting case of inherited glioma retinæ.** von Hoffmann reported a case of bilateral glioma retinæ in a child one year old, the only child of a mother 28 years of age who had had her right eye enucleated for glioma retinæ when two years old.

4. PFALZ (Duesseldorf)—**The relations of corneal opacities to the acuteness of vision.** The central vision has hitherto been valued as the criterion of the bad influence of corneal opacities, or for their improvement either as the result of therapeutic measures or spontaneously, but hitherto satisfactory means have been lacking by which the effect on function could be estimated from the size, kind, and position of a corneal opacity. The author has sought to replace the very different subjective experience of the individual physician and the pictures in his memory by drawings which he has made of each case of corneal opacity for several years. He finds that the condition of the surface is more important than density, extent, and position of the opacity. The ophthal-

mometer and keratoscope are needed to aid the drawings. After years of observations of this kind he has arrived at the following conclusions. The function lowering power of corneal opacities depends not so much on the dispersion of light caused by them as on irregular "facetted" refraction of light, not only within the opacity but also in the neighboring clear tissue. A nebula usually does not cause in practice the disturbance the theory indicates, even for the other normal eye. When it does cause such a disturbance the surface is usually found to be very irregular, so that the irregular refraction just designated facetted is the causative agent. The basis of this is to be sought in the irregular distribution of the lymph in the parenchyma and epithelium of the cornea which persists many years as the impression of a not yet fully complete reaction, especially in dyscrasic inflammations of the cornea, and may exert a bad influence on the surface even of the clear portion of the cornea in opacities of traumatic origin, but may disappear without treatment after several years and heal with true clearing up and diminution of the opacity and improvement of the vision. This is of importance in considering the questions of the time and extent of tattooing. The author considers incorrect Schmidt-Rimpler's theory that ascribes a particularly bad influence to the bright irradiation of the peripheral portions of the retina as compared with the shading of the centre by the corneal opacity, but believes instead that a purely physico-optical law governs the lowering of the vision which can be partially exhibited in the photographic camera. Finally he presents the following conclusions: 1. Superficial corneal opacities which do not involve Bowman's membrane, after the disappearance of all signs of reaction, leave the surface nearly or quite intact and exert no noteworthy influence on the central vision as long as they do not cover more than $\frac{1}{7}$ of the area of the pupil. 2. Larger opacities of the same kind lower the vision. As long as $\frac{1}{3}$ of the area of the pupil remains clear and the surface is regular the vision does not sink below $\frac{1}{2}$ to ^{1}. 3. Even with permanent deep opacities, when the surface of $\frac{1}{3}$ of the area of the pupil is clear and the astigmatism is regular, the vision is seldom less than $\frac{1}{4}$ to $\frac{1}{5}$. 4. In total opacities in which the papilla and vessels can still be distinguished in the upright

image and the surface of the cornea is regular, visions of $\frac{1}{10}$ or better are to be expected, at least sufficiently good to permit of binocular vision.

5. v. ROHR (Jena)—**The theory of anastigmatic cataract lenses.** After a historical introduction the astigmatic deviations of the oblique rays were considered as they are shown in the delineation of an object on a plane surface 30*cm* distant through a plano-convex glass of 14½D, when the focal point of the principal rays lies upon the axis 26*mm* from the plane surface. The problem how to do away with these astigmatic deviations cannot be solved with single spherical lenses, but may be approached with binary combinations. By placing one behind the other two separate, chromatically uncorrected lenses a reduction of the astigmatic deviation of about 97.3% is obtained, with a visual field on the side of the object of 2 x 21.8°. The other binary combination is fastened together and achromatic. The visual field on the side of the object is only 2 x 16.3°. The astigmatism for rays forming an angle of about 15° on the side of the object is practically wiped out.

6. HERTEL (Jena)—**Anastigmatic cataract glasses in practice (with demonstrations).** The marked limitation of the power of the moving aphakic eye to see clearly is due to the great astigmatism of the cataract glasses for rays entering outside the axis and can be corrected only by anastigmatic cataract lenses. The lateral vision of aphakics is better with these new glasses than with the ones hitherto used. If a patient reads $\frac{1}{6}$ with a + 12D he can see these test letters over an area of at least 52° in extent, while with the ordinary biconvex lens the same letters can be read over a field of only about 12°. In the same way with the new reading glasses, *e.g.* + 15.3D, the field of clear lateral vision is about four times as large as with the old glasses. In a special type of the new glasses in addition to the enlargement of the field of clear vision an unendurable thickness and weight of the glasses is avoided by making the field somewhat more narrow than in the simpler type. Experience must determine in which cases the first and in which the second are to be preferred. The firm of C. Zeiss (Jena) consider these instructions necessary for the construction of the new glasses: A statement of the glasses with which the best vision can be obtained both for

distance and near, whether biconvex, planoconvex, or periscopic glasses were used in testing, the distance of the glasses from the vertex of the cornea, and any desires in regard to the extent of the field to be realized.

7. LEVINSOHN (Berlin)—**The real actuating cause of myopia.** The author shows first that the supposed increase of tension during near work to which the lengthening of the axis is ascribed by the advocates of the theories of myopia is not demonstrably present, and that the anatomical substratum of the changes found in myopia are in direct contradiction to the theories. He then indicates that in near work in addition to the accommodation and convergence the bending of the head exerts a very real influence upon the eye in consequence of gravitation. First by the orbit overfilling with blood and pressing the eye downward, second the direct action of gravity upon the eyeball. The author shows curves and manometric measurements which analyze these forces separately. In addition to this the pressure of the full and tense cushion of fat upon the posterior pole causes trophic changes that result in a softening of the tissue at this place. The author states that the effect of gravitation is exerted chiefly on the temporal margin of the entrance of the optic nerve and that the formation of staphyloma, the dilatation of the canal, and the elongation of the axis are its natural consequences. Also the cracking of the pigment epithelium and of the elastica, the detachment of the vitreous and of the retina have their primary cause in this force. If the bending of the body and of the head is the true exciting cause of myopia the prevention of myopia must be sought in the energetic struggle against such positions.

8. ZUR NEDDEN (Bonn)—**Experimental studies concerning specific relations between the retina and the kidneys.** If a dog is subcutaneously injected with crushed kidneys from a rabbit anti-bodies against rabbit kidneys are formed which are kept in the blood serum. This anti-kidney serum, or nephrotoxin, attacks not only the kidneys, but to a much less degree the liver and the brain. At any rate the liver and brain possess albumin groups identical with those present in the kidney. The immunity reactions are always specific. If now nephrotoxic serum is injected into the aural vein of a rabbit a kidney

disease results which is usually fatal in a short time. No pathological changes are clinically demonstrable in the eye. But if the nephrotoxic serum is injected into the common carotid, so that it comes in contact with the eye in greater quantity, bluish white superficial foci appear in the retina at the end of two hours, rapidly increase, and reach their maximum in from six to eight hours. The animals usually die from the kidney disease on the second day. In one case the rabbit survived. In this case the retinal affection retrograded after ten to fourteen days and left white shining foci of degeneration between which a pigmentation could be seen here and there.

Microscopic examination seven hours after the injection of the nephrotoxin showed that the affection was situated exclusively in the innermost layers of the retina. In that place an albuminous fluid had accumulated which had pressed apart the supporting fibres, that produced peculiar appearances resembling hollow spaces. Nothing pathological was to be seen in the nerve fibres, ganglion cells, or glia cells. There were no signs of inflammation or vascular changes; inflammatory and degenerative processes appear secondarily at a later date.

Control experiments with normal dog serum caused no pathological affections either in the kidneys or in the retina. The toxic serum for rabbits' kidneys acted toxically only on the retinæ of rabbits, it did not produce the same effect in guinea-pigs, and therefore the action of nephrotoxin upon the retina is specific. As the anti-kidney serum contains at the same time anti-bodies against the retina the kidneys and retina are intimately related in the sense that the same kind of albumin groups are present in both.

9. W. Uhthoff (Breslau)—**Cataract operations in diabetics.** Uhthoff reported a series of 115 cataract operations in diabetics. The results must be considered favorable because not one of these 115 eyes was totally lost. Two obtained only a minimum amount of vision. One patient died in diabetic coma five days after the operation. Good vision was obtained in 68%, useful vision in 18%, poor vision in 14%, total blindness, no perception of light, in 0. These results were just as good as those obtained after cataract extractions in the non-diabetic.

The complications met with were marked iritis, 3 times with hypopyon, in 6%, slighter degrees of iritis in 5.4%, post-operative glaucoma in 0.9%, transient increase of tension in 1.8%, detachment of the choroid in 0.9%, hemorrhages into the anterior chamber in 8.9%, retinal hemorrhages in 4.5%, hemorrhages into the vitreous in 1.8%, diabetic retinitis in 2.6%, albuminuric retinitis in 0.9%, delayed reformation of the anterior chamber in 1.8%, choroideal changes from myopia in 1.8%, death from diabetic coma on the fifth day in 0.9%.

The author then speaks of the views formerly entertained and shows how a great revolution in regard to the prognosis of operations for diabetic cataract has taken place under the influence of antisepsis and asepsis. The most frequent complication was iritis, as was to have been expected from the greater predisposition of diabetic tissue to inflammation in consequence of the lowered resistance of the tissues and the greater virulence of micro-organisms in diabetes. In regard to the anti-diabetic regimen before and after the operation the author is opposed to its too rigorous observance.

The technique of the operation is the same as in other cataract extractions, performed recently without iridectomy. A drop of a ½% solution of eserine is instilled immediately afterward, which he thinks a sure protection against subsequent prolapse of the iris without prejudice to the healing of the wound.

10. V. HIPPEL (Heidelberg)—**Palliative trepanation for choked disk.** From a study of 221 reported cases of trepanation of patients suffering with choked disk the author concludes: 1. In the majority of cases trepanation induces a retrogression of the choked disk that lasts a long time or is permanent. 2. The prognosis for preservation or improvement of the vision is favorable when the operation is performed early, unfavorable when the vision has become practically useless. In most cases the operation was performed too late. 3. In certain cases of tumor the life of the successfully trephined is lengthened so that from this point of view the operation may be said to be indicated. 4. The operation can result not only in removal of the choked disk but in complete recovery, because it can be employed in cases which clinically

simulate the symptoms of tumor, such as chronic hydrocephalus, pseudo-tumor, acute or chronic swelling of the brain, and serous meningitis. Such cases may recover without the operation, but it will be with blindness. 5. The danger attending the operation is not to be considered slight, but it is certainly less in the cases in which the preservation of the vision furnishes the indication than that shown by the mortality attendant upon all palliative trepanations, given by Bergmann as 47.7%. 6. The immediate danger of the operation may be reduced by certain precautionary measures: chloroform, (not ether), division of the operation into two parts performed at different times, cocainization of the dura, avoidance of a sudden evacuation of fluid, immediate closure of the wound, avoidance of the osteoplastic methods in favor of simple trepanation. 7. A sufficient lowering of the intracranial pressure can be obtained in certain cases without opening the dura, but in the majority of cases such an opening appears to be necessary. 8. The hernias of the brain that very frequently appear in cases of tumor are necessary for the attainment of the desired end, therefore they should not be suppressed, but only their development to an injuriously large size prevented. 9. When the tumor can be located with some probability the trepanation should generally be performed at the corresponding place, otherwise in the right parietal region. 10. Bad results cannot always be avoided and the relatives should be informed of this fact. Still the operation should be recommended when the vision is beginning to fail as the result of a choked disk. 11. Lumbar puncture can be used therapeutically only when a tumor is improbable. Puncture of the ventricles is of secondary value to trepanation. 12. The general use of Neisser's diagnostic puncture is useful as a precautionary measure to prevent blindness from choked disk.

SESSION WEDNESDAY AFTERNOON, ROEMER (GREIFSWALD) IN THE CHAIR.

1. DIMMER (Graz)—**Demonstration of photograms of the fundus of the eye.**

2. EMANUEL (Frankfort)—**Preparations of a melanotic tumor** of the lachrymal caruncle in a patient with regional

multiple neurofibromatosis of one of the lower extremities. The preparations shown were of a neurofibroma of the thigh and of a melanotic epibulbar tumor in the capsule of which nerve fibres were present.

Discussion: WOLFRUM (Leipsic) has studied 14 nævi of the conjunctiva and was able to demonstrate in all connection with the epithelium either in the form of detachment of single basal cells, or of larger groups of cells. Therefore from their genesis the melanotic tumors represent basal cell tumors.

3. SEEFELDER (Leipsic)—I. **Another demonstration of embryonal human eyes.** (*a*) Seefelder exhibited microscopic preparations and diapositives of the rudimentary eye of a very well-preserved human embryo 5*mm* in its greatest length, about 3 weeks old. The lens sac is still connected round about with the ectoderm and widely open toward the amniotic cavity. Lens cone very strongly developed. In the vitreous chamber a dense fibrillary network proceeding for the most part from the lens and retina. The hyaloid artery appears first as the primitive bulbus hyaloideus (Fuchs), which arises from the circular artery near the margin of the secondary optic vesicle at the site of the ventral cleft, which it fills, and ascends behind the lens into the vitreous chamber, where it ends in a cul-de-sac. The outer layer of the secondary optic vesicle is still entirely without pigment and covered by a dense vascular network. The optic vesicle is short and thick and of a cylindric form. The invagination has not yet resulted in the cleft. The degree of development of the rudimentary eye corresponds with that of an embryonic rabbit at the middle of the eleventh day and with that of an embryonic pig 7 or 8*mm* in length.

(*b*) He also exhibited microscopic preparations of a 3 months' embryo in which the inner relations between the vessels and fibrils of the vitreous could be seen with remarkable clearness.

II. **Demonstration of preparations of a case of complete congenital aniridia.** A woman 25 years old with bilateral, clinically total irideremia, cataract, and nystagmus.

The iris was totally absent nowhere but only greatly diminished in size. The sphincter and dilatator were absent.

The angle of the anterior chamber was free only on the temporal side, elsewhere it was closed by tissue from the iris. Of the other pathological changes the entire absence of a fovea centralis is to be specially mentioned as this may be the cause of the usually high degree of amblyopia and of the nystagmus met with in aniridia. The condition is not simply one of a local malformation confined to the margin of the optic vesicle, but is produced by a disturbance of the development of the most different parts, particularly of the ectodermal structures of the eye.

4. ERDMANN (Rostock)—**Ocular changes from dimethyl sulphate.** Erdmann has tested the action of the vapor of dimethyl sulphate on the eyes of rabbits and guinea-pigs because of a case of injury to the eye by this vapor observed by him. His experiments show that in the eyes of both men and animals dimethyl sulphate causes with inflammatory symptoms a shrivelling and vesicular detachment of the corneal epithelium and a high degree of serous infiltration and swelling of the ground substance, both the consequence of a hydropic degeneration and detachment of the endothelium. After regeneration of the latter the diffusely opaque cornea clears up again with the exception of a delicate parenchymatous opacity in the centre.

5. SCHREIBER (Heidelberg)—**Demonstration of an adenoma sebaceum of the lachrymal caruncle, and of a hyaline tumor of the plica semilunaris.** The first tumor came from the caruncle of a man 58 years of age where in the course of twelve years it had developed to the form and size of a vest button. The microscopic examination showed it to be a typical benign adenoma sebaceum. The second tumor had slowly developed for ten years in the plica semilunaris of a man 24 years old. In its form it resembled the third lid of a rabbit and it lay upon the eyeball without being adherent to it. Microscopically the tumor was composed of homogenous layers that infiltrated the connective tissue fibrillæ and resembled at first glance hyalin or amyloid, but did not give the chemical reactions characteristic of these substances. Yet on the basis of its morphological peculiarities he would class this among the hyaline or amyloid tumors.

6. REIS (Bonn)—**Demonstration of microscopical pre-**

parations. I. **So-called intraocular pseudosarcoma.** Reis showed microscopic specimens of the right eye of a girl 16 years old in which an absolutely opaque dark brown mass filled the vitreous chamber behind the lens and appeared to be a melanosarcoma of the choroid. Examination showed that the appearance of a melanotic sarcoma was only simulated by a total hemorrhagic detachment of the retina with diffuse hæmatogenous pigmentation of the retina which must be considered as the final result of a disease of the retina belonging to the group of retinitis proliferans.

II. **Primary tumor of the cornea. An epibulbar tumor confined to the surface of the cornea of the right eye of a woman 72 years old.** Histologically it was a chromatophoroma (Ribbert) almost without pigment. Its development is to be ascribed to chromatophores, and the exclusively epicorneal extent of the growth is explained by the proliferation of the corneal portion of a congenital nævus at the corneal margin and encroaching on the cornea.

7. Bielschowsky (Leipsic)—**An unusual form of syphilitic disease of the cornea.** A man 32 years of age who had acquired syphilis five years before had at first a monolateral iritis. Fourteen days later he was seized with extremely severe pain and two circumscribed, yellow deposits appeared deep in the cornea, one of which attained a great extent within a few days, covering about ⅓ of the cornea, while the other at the margin of the cornea formed a yellow ring not closed above, and the anterior chamber became half filled with pus. Evacuation of the pus by paracentesis produced at first no improvement except relief of the pain, but after some days a rapid retrogression of the symptoms began. Five months after the attack the cornea still remained slightly opaque and dull with some deeply lying vessels. The vision, which had fallen to counting fingers at a very near point, had improved to ⅓. The syphilitic nature of the affection was determined from the history, the papules visible at first on the iris, and the influence of specific treatment.

8. Roemer (Griefswald)—**The new pneumococcus serum and its use in ulcus serpens.** The clinical consideration of the ulcers does not suffice; it is necessary to know in each case the virulence of the stock of pneumococci in question. Ulcera

serpentia can be caused by pneumococci of so little pathogenic strength that they can be easily overcome by the organism, and on the other hand by pneumococci of such intense virulence that all treatment fails. Between the two lies the field for serum therapy. But the recognition of a curative action is admissible in individual cases only when the clinical observation is confirmed by animal experiment. Only the specific serum of Roemer can as yet show this protective action against virulent stocks of pneumococci. The curative effects of other non-specific means can be asserted only on the ground of clinical impressions, they cannot be demonstrated by animal experiment.

9. STARGARDT (Strasburg)—**Demonstration of microscopic preparations.** I. **Phlyctenulæ after ophthalmo-reaction.** The phlyctenulæ correspond perfectly with the pictures given by Leber of the common phlyctenulæ of the conjunctiva. Giant cells are present, but no caseation. Neither tubercle bacilli, nor the so-called granular form (Much) were demonstrable.

II. **Epithelial cells from acute trachoma with Prowazek-Halberstaedt's bodies.** Among 140 cases of various forms of acute and chronic conjunctivitis the typical bodies were found only in one case of acute trachoma and in one case of slight, non-bacterial blennorrhœa neonatorum. Stargardt showed preparations and drawings of the various changes in the epithelium in conjunctivitis and of the typical bodies in trachoma.

10. LOEHLEIN (Greifswald)—**Congenital fistulæ of the lachrymal sac as developmental anomalies.** Loehlein has studied microscopically three cases of congenital fistulæ of the lachrymal sac of non-inflammatory origin and found the sections to correspond almost exactly with those of normal canaliculi. From what he found and from the modern researches concerning proliferation in the fœtal tear passages he concludes that congenital fistulæ of the lachrymal sac are not the result of an arrest of development, but of an unusual growth of an epithelial sprout from the tear passages, and are thus similar to the normal and the supernumerary canaliculi.

11. SCHUSTER (Frankfort)—**Demonstration of a micro-**

scopic preparation in re the pupillary reflex. Schuster exhibited in a frontal section of a new-born rabbit, passing through the gray matter below the end of the optic nerve in the corpora quadrigemina and into the nucleus of the oculomotorius, impregnated with silver by Bielschowsky's method, a network of fibres of greater abundance and density than has hitherto been supposed to exist. This would doubtless serve for all possible transmissions from the optic nerve to the region of the oculomotorius in the way suggested by Edinger.

12. BARTELS (Strasburg)—**Transplantation of fat into Tenon's capsule for the purpose of obtaining a good stump after enucleation.** Bartels transplanted fat taken from the thigh of the patient into Tenon's capsule. Healing was good and the fat did not become resorbed. He exhibited a preparation of the orbit of a dog in which fat was transplanted three months before it was killed. In man the substratum of fat so produced afforded a good hold to the prothesis. On account of its simplicity he recommended the transplantation of fat especially in children after enucleation in order to fill out the orbits well. One may perhaps thereby avoid the faulty growth of that side of the skull.

13. HOPPE (Cologne).—**Demonstration of a new model of the mirror optometer.** The modifications are: 1. Movable mirror for the graduation of the illumination of the test types by daylight or electricity. 2. Division of the visir mirror into two halves movable about a common axis. By this is rendered possible (*a*) testing of the one eye, rapid alternate testing of the two eyes without covering one eye. (*b*) Simultaneous appearance of the test types seen by the right and the left eye, each with the clearness corresponding to the vision and refraction. (*c*) Demonstration of binocular vision; easy comparison of the vision of the two eyes even when they differ but slightly. 3. Any table may be used and any kind of lamp for illumination. 4. The examiner can handle the test types himself, indicate the letters with his finger, and write down the vision himself.

14. WESSELY (Wuerzburg)—**Demonstration of some simulation tests.** The author gives two simple new tests. One consists in holding a red-green lorgnette, the glasses of which are alternated in position, before the eyes of the person ex-

amined in a dark room while he looks at a candle flame and is required to state the color of the light as seen by him. The other consists of two converging tubes through which the patient is required to look while one or two fingers are slowly passed before the openings. In this test the double images cannot be suppressed because they arise after each other. The author also exhibited a movable stereoscope chart for the testing of binocular perception of depth.

15. FLEISCHER (Tuebingen)—**Demonstration of microscopic preparations of two tumors of the iris.** One case was that of a typical spindle cell sarcoma from a man 26 years old, which had grown rapidly and had infiltrated the angle of the anterior chamber far beyond the limits clinically recognizable. In the second case a tumor as large as the head of a pin had been observed in a man 59 years old for six years, during which it had not increased in size. The eye became blind from glaucoma simplex and was finally enucleated on account of acute glaucoma. Examination showed the presence not only of the clinically observed tumor, but also of an infiltration of the iris with cells with relatively large oval nuclei. The structure of the iris was preserved and it was of normal thickness. The author considered it an endothelioma arising from the anterior endothelium of the iris.

16. GILBERT (Munich)—**The spiral fibres in leucomata.** Almost always there can be found spiral fibres near hyaline concrements if specific methods of staining are employed and the search is maintained long enough. These are not elastic tissue but a substance resembling fibrin with hyaline transformation. The spirochætal nature of the silver spirochætæ in the corneæ of syphilitics has been questioned by Schulze and others because the spiral fibres of the leucomata were not taken into consideration. The attempt to call into question the parasitic nature of the spirochæta pallida can now be considered essentially nugatory. But the spiral fibres of the leucomata must be excluded from the evidence against the parasitic nature of the spirochæta pallida, for such differences in the size and thickness of the different spirals as are seen in the leucomata are not known in the spirochætæ of syphilis. The differential point is that the leucoma spirals are not stained by Levaditi's method.

17. G. Mizuo (Osaka, Japan)—**Demonstration of two malformations of the eye.** I. **Teratoma from the orbit.** In the left orbital cavity of a Japanese infant a tumor grew rapidly until it attained a length of 17*cm*, perforated the skin of the lower lid at the end of forty days, and then developed very rapidly on the face so that it soon had to be removed. The tumor had almost all the constituents of a fœtus, head, body, anterior and posterior extremities, penis, brain, spinal ganglia, throat, stomach, large and small intestine, vertebræ, femur, a pedicle like an umbilical cord, skin, and lanugo.

II. **A case of complete cyclopia.** Placenta-like end-brain, incomplete mid-brain, only one optic nerve and one eye. No other abnormality elsewhere in the body.

18. F. Schanz (Dresden)—**Demonstration of the reflex closure of the lids to be produced by ultraviolet rays and the fluorescence of the lens induced by these rays.** If the rays from an electric arc light are focussed into an animal's eye by means of a quartz lens the lens of the eye appears actively fluorescent. This is particularly marked when the visible rays are weakened by a blue uviol glass, when the bright green fluorescent lens is seen in the dark blue illuminated eye. This fluorescence is produced solely by the ultraviolet rays, for if a glass which will absorb ultraviolet rays, such as the euphoglass discovered by Stockhausen and the author, is interposed between the source of light and the eye the fluorescence immediately disappears. When this glass is removed the fluorescence immediately reappears and at the same time the lids of the animal close spasmodically. This reflex is the best evidence that the ultraviolet rays, which were cut off by this glass, irritate the eyes.

Which ultraviolet rays are they that excite this reflex? The short-waved, of less than 300*mm* wave length, are those that are commonly absorbed by glass, the long-waved, of from 300 to 400*mm* wave length, are not absorbed by common glass. Birch-Hirschfeld has questioned whether it is necessary to protect the eyes from the long-waved ultraviolet rays and has concluded that so far as we know it is not. This experiment proves that rays of 300 to 400*mm* wave length are harmful to the eye, for the above described reflex closure of the lids takes place even when a glass plate that will absorb

the short-waved ultraviolet rays is interposed between the source of light and the eye. Still better is this seen in the fluorescence of the lens for this is not influenced in the least by the interposition and removal of a glass plate 18*mm* thick.

The ultraviolet rays produce severe conjunctival irritation, but do not penetrate deeply. We find the same results as in irradiation of the skin. The ultraviolet rays of 300 to 400*mm* wave length are those that penetrate deeply and cause the fluorescence of the lens, the opacities of the same, the erythropsia and the disturbances of color sense described by Birch-Hirschfeld. We have found by our experiments that with intensive irradiation the fluorescence of the lens abates in a few hours, that the material in the lens which renders fluorescence possible is bleached out. As soon as this has taken place the ultraviolet rays of 300 to 400*mm* wave length penetrate to the retina and produce erythropsia as in the aphakic eye. The disturbances of color sense described by Birch-Hirschfeld in patients who had worked with a source of light especially rich in ultraviolet rays likewise arise only when the lens has been bleached by ultraviolet rays of 300 to 400*mm* wave length.

19. SCHIECK (Goettingen)—**Does exenteration of the eyeball afford a sufficient protection against the onset of sympathetic ophthalmia?** As sympathetic ophthalmia is recognized to be a metastatic infectious disease the as yet unknown exciter of which finds a favorable nutritive medium in the uvea and is probably carried by the blood current from one eye to the other, it is clear that all methods of operation which leave the uveal tract in the eye should be condemned. Therefore there can remain no differences of opinion in regard to the value of neurotomy, or of optico-ciliary neurectomy. The case of exenteration of the globe is different, for in this operation all such tissue is removed from the eye. No case has hitherto been published which could be considered unobjectionable evidence of the insufficient protection afforded by this operation for, as pointed out by Schirmer, in a number of published observations the interval between the operation and the attack of sympathetic ophthalmia was so short that there was a possibility that the carrier of the infection was already in the blood at the time of operation. In other

cases a doubt exists whether true sympathetic ophthalmia was present. Schieck now reports a case in which sympathetic ophthalmia occurred several months after exenteration of the injured eye. Examination of the stump left after the exenteration revealed that a small portion of the uveal tissue had been left behind and that this presented a focus of the typical structure of the sympathetic-producing inflammation. Exenteration of the globe is therefore not only uncertain, but dangerous as well, because the rekindling of an inflammation in the stump escaped observation and the enucleation of the remains of the globe came too late.

Discussion.

SCHMIDT-RIMPLER has seen sympathetic ophthalmia six weeks after exenteration.

20. V. HIPPEL (Heidelberg)—**Eight-days-old detachment of the retina with retinitis albuminurica.** The preparations showed the following details. Uniformly coagulated fluid between the retina and choroid. Extensive detachment of the outer parts of the rods and cones which appear as long bands. Œdema of the retina and lodgment of coagulated masses. Distinct changes in the retinal vessels were wanting. There were no changes on the inner surface of the retina and vitreous to indicate retraction. Marked changes in the choroid and in the pigment epithelium lying upon it, to the greatest degree in the region of and below the posterior pole. Numerous thromboses in the larger and smaller vessels and capillaries. Hyaline degeneration of the vessel walls with endarteritis in places. Masses of multi-nucleated round cells in the dilated vessels, their walls, and the surrounding tissue. Superficial hemorrhage in the suprachoroidea. Defects and swelling of the pigment epithelium, and delicate pigmented cords between the retina and choroid, probably caused by the proliferation of pigment epithelial cells along threads of fibrin.

21. MORAX (Paris)—**Sporotrichosis palpebrale.** Morax exhibited cultures of sporothrix Schenki that he had isolated from an ulcer of the lid associated with swellings of the submaxillary and preauricular glands. The infection had a slow development and was easily controlled by iodide of potassium.

The culture colonies are at first whitish, but then become blackish brown. He had been unable to reproduce the ulcerations experimentally on animals.

22. REMY (Dijon)—**Technique and theory of the diploscope.** Remy exhibited a series of combinations of type for his diploscope and explained their application in different cases of simulation and disturbance of binocular vision.

SECOND SCIENTIFIC SESSION, THURSDAY, AUGUST 6TH, HOFFMANN (BADEN-BADEN) IN THE CHAIR.

11. GREEFF (Berlin)—Greeff describes in detail **how to expose and stain the trachoma bodies discovered by him.** He claims that they are in all respects identical with the so-called chlamydozoa discovered by Halberstaedter and Prowazek. Both parties have by chance worked simultaneously and their labors supplement each other. Greeff then showed the stages of development of the bodies in the epithelial cells from the single granules surrounded by an areola, which lie together in pairs like diplococci, to the small and large masses surrounded by a mantle and the cells which entirely filled by the granules finally burst and pour out their contents into the surrounding tissue. It is not a purely epithelial process, but the formations extend deeply into the follicle.

12. KRUSIUS (Marburg)—**Pathology of fusion.** Krusius reported the results of the clinical analysis of about 200 cases of disturbances of fusion. There is a close clinical connection between a faulty power of fusion, a monolateral or bilateral reduction of visual acuteness, and strabismus of one or alternately of both eyes. In this triad of symptoms disturbance of the power of fusion is a constant quantity and to a certain degree the starting point of the other symptoms. He distinguishes three types: (*a*) Disturbance of fusion with incapacity for bilateral simultaneous visual perception in the macular region of the retina. (*b*) Disturbance of fusion with amblyopia of one or both eyes. (*c*) Disturbance of fusion with strabismus of one or both eyes. He inclines toward the view that the presence of a congenital amblyopia without demonstrable organic cause is rare as compared with a functional amblyopia. In all monolateral functional amblyopias the

accurate comparison of the data furnished by the objective examination shows that the amblyopic eye is inferior to the other in anatomic construction or in other minor organic conditions and was predestined to the development of a functional amblyopia. He confirms the observations of Claude Worth.

The basis of any rational and not purely symptomatic treatment of strabismus and the other affections of fusion must be: (*a*) To inaugurate at as early an age as possible therapeutic measures in cases in which prophylaxis may be obtained in part. (*b*) To remove any amblyopia present so far as possible, or to prevent its beginning. (*c*) So far as vision will permit, to commence fusion exercises adapted to the degree and quality of the disturbance of fusion. If in these three points treatment is energetically carried out the correction of strabismus can be a less urgent matter, for this is only a symptom of the other disturbances and disappears with them in a large percentage of cases. When it does not an operation can be performed later. The author recommends in addition to atropin and bandaging of the good eye, the rendering of the amblyopic eye emmetropic, and the good eye artificially ametropic, by means of glasses. The good eye should be rendered as ametropic in comparison with the corrected amblyopic eye as the amblyopic eye was to the good one without correction.

Finally the author exhibited a modified amblyoscope for fusion exercises which differs from the usual model in that it can be used for any pupillary distance and also in great differences of squint and in divergent strabismus. Another modification is that the alternate rendering visible of an image with darkening of the other, and vice versa, is rendered possible by alternations increasing as desired until both images are simultaneously visible. He emphasized the need of such an appliance for fusion exercises in cases of disturbances of fusion with incapacity for bilateral simultaneous visual perception in the macular region of the retina.

13. Th. Leber (Heidelberg)—**The production of detachment of the retina.** Leber reports that the results of his recent investigations concerning the pathological changes in ordinary detachment of the retina confirm the view advanced by him some years ago that this trouble is produced by tension

from within. The active agent appears to be the contraction of newly-formed cellular fibrous tissue on the inner surface of the retina in the vitreous.

14. LENZ (Breslau)—**The applicability of the antiferment treatment of suppuration in ophthalmology.** The breaking down of tissue in acute inflammation is primarily due to a proteolytic ferment set free by the destruction of the leucocytes with lobulated nuclei, the action of which can be neutralized by an antiferment found in the blood serum, but somewhat more richly in pathological exudates such as ascites. The author has tested the value of this method of treatment for suppurative processes in ophthalmology with ascitic fluid containing such an antiferment to which a trace of chloroform had been added. Useful results were obtained in abscesses of the lids and in acute dacryocystitis, especially when the tissue about the lachrymal sac was broken down. On the contrary the attempt failed in chronic dacryocystitis and purulent conjunctivitis. The causes for failure the author ascribes to the facts that in purulent conjunctivitis the mucous epithelium is preserved and consequently the necessary contact of the antiferment with the inflamed tissue is prevented, and that in purulent inflammation of mucous membranes the true proteolytic breaking down of tissue, against which the antiferment primarily acts, does not take place. In ulcerative keratitis, particularly ulcus serpens, a specific influence was not observed because it is impossible for the antiferment to penetrate to the progressive infiltration still covered with epithelium.

15. HAPPE (Freiburg)—**Non-specific serum therapy in infections of the eye.** Happe has made 100 inoculations of pneumococci and staphylococci in the vitreous, anterior chamber, and cornea of rabbits. Half of the inoculations were made in animals immunized, part by feeding with sterile compressed yeast, part by injections of Deutschmann's serum or of diphtheria serum, the other half in animals that were not immunized. In order to make the infections in the vitreous, anterior chamber, and cornea as nearly uniform as possible equal quantities of a salt solution containing a known proportion of germs were injected by means of a very exact microsyringe. These experiments failed to show the beneficial

effect ascribed to Deutschmann's serum and diphtheria serum in infections of the eye.

THIRD SCIENTIFIC SESSION, THURSDAY AFTERNOON, AUGUST 6TH. SCHREIBER (MAGDEBURG) IN THE CHAIR.

16. SCHREIBER and WENGLER (Heidelberg)—**Experimentally produced changes in the retina.** In order to study the effect of artificially-produced increase of tension upon the retina and optic nerve, Schreiber and Wengler injected into the anterior chamber of a rabbit's eye electrolytic iron to cause an obliteration of the angle of the anterior chamber with increased tension, which resulted in a marked increase in the size of the eyeball and the clinical picture of hydrophthalmos. Although the retina was thus greatly stretched and thinned the degeneration of ganglion cells and nerve fibres met with in hydrophthalmos in man was not present as a rule. Hence the retina possesses a hitherto unrecognized great tolerance to gradual increase of tension and a marked extensibility. But if the increase of tension reaches a very high degree immediately after the injection and maintains the same, degeneration of the ganglion cells and nerve fibres takes place very early and after twenty-two days can be traced upward into the opposite optic tract. With equally high tension the greater increase in the size of the globe and the associated stretching of the retina affords a relative protection against degeneration. Dogs' eyes experienced a still greater increase in size than rabbits' from the injection of iron, yet the increase in tension did not result in hydrophthalmos, but in occlusion and closure of the pupil, with abolition of the anterior chamber quickly followed by detachment of the retina.

Schreiber and Wengler also induced a secondary glaucoma in rabbits by the injection of concentrated scarlet oil into the anterior chamber, but this method presented no advantages over the injection of iron. On the contrary it resulted in very noteworthy effects of the scarlet oil upon the retina, consisting of spots of atrophy that appeared after a few days, particularly in the outer layers of the retina, and of a lively cell proliferation of both the pigment epithelium and of the ganglion cells. In one case displacement of the ganglion cells

into the outer layers of the retina was observed in the places where the latter were not atrophic. In addition there was an enormous hypertrophy of both the displaced ganglion cells and those remaining in loco. Finally there were numerous thread-like formations in the ganglion cells in the various stages up to complete segmentation. The mitotic cells presented all the criteria of the ganglion cells, corresponding size, beautifully formed pericellular space, and a long process directed to the layer of nerve fibres.

17. KRAUSS (Marburg)—**Orbital plethysmography.** Krauss reported the results of the systematic plethysmographic studies he had made on human orbits by means of an air-tight capsule he had devised. The studies furnish scientific evidence of the almost unlimited usefulness of the capsule; its practical and clinical advantages were portrayed and its construction was schematically demonstrated. Numerous examples showed how the capsule permits the convenient application of all sorts of therapeutic means to the eye and the lids. The author chose to speak only of the scientific results obtained in man which are connected with plethysmography of the orbit. As this method presupposes a perfectly air-tight capsule it forms, so to speak, a test of capacity for the required permanent density of the capsule and of its usefulness. He demonstrated on a chart the normal curve obtained by this means of healthy adults and gave brief explanations. His studies have thus far been in regard to the physiology and pathology of the closure of the lids, the lachrymal secretion, various movements of the eyes, the venous circulation of the orbit, and the vasomotor sof the orbital vessels. As the anterior wall of the capsule is transparent it is possible to place the eye itself under a permanent outer and inner control. A suitable lens inserted in the anterior wall of the capsule renders easy ophthalmoscopic examination. The author pointed out how clinical and experimental inquiry along these lines reveals many new problems for solution.

18. BIELSCHOWSKY (Leipsic)—**Unusual symptoms in mental blindness.** The patient, in whom mental blindness had remained as the only disturbance after a brief loss of consciousness, had almost normal vision of one eye and $\frac{2}{3}$ vision with the other, due to hypermetropic astigmatism, with almost total

optic asymbolia. Although examination of the field revealed no gross defects he was usually conscious of the central image alone. The image disappeared as soon as it was thrown on the peripheral parts of the retina whether unintentionally or by means of prisms. Consequently there were lacking all fixation movements of the eye that under normal conditions automatically follow stimulations of the peripheral parts of the retina, although the motor apparatus was intact and reacted promptly when the attention and the attempt at fixation was forcibly directed to the image on the periphery of the retina, as is the case in testing the field of vision. The orientation of the patient was greatly interfered with, both by the loss of topographical power of conception regularly to be met with in mental blindness, and by a disturbance of depth localization unusual in mental blindness. The patient greatly underestimated the distance to objects seen by him, while by pacing a distance, or handling an object he could give the measurement correctly. Together with the underestimation of distance was associated an underestimation of the size of objects and the appearance of phantom movements on the attempt to seize the object looked at. These unusual symptoms of mental blindness are explainable by lesions in the occipital and parietal lobes, although they have been observed immediately after successful operations on persons born blind.

19. VOGT (Aarau)—**Cause and nature of erythropsia from dazzling.** Vogt presents the following as the results of his experiments.

(*a*) Erythropsia is not a rare, but is in its lesser degrees of intensity one of the most frequent physiological phenomena, which constantly and largely influences the color perception of every man. Any glaring source of light, particularly diffuse sunlight reflected from a white surface, produces after a few minutes' exposure changes in our color perception which must be classed as erythropsia. On account of their great frequency our retinas have become accustomed to these changes so that they become visible to us only when we protect one eye from the action of the light and use it as a control. Then the eye that has been exposed to the action of the light for some minutes sees the colors differently from the eye that

has not been exposed. All colors receive a tone of rose or purple. Particularly clear are the appearances of yellow as reddish yellow, dark brown as reddish brown, gray as reddish gray, and white as pale rose. Very dark objects appear to be wrapped in a greenish veil. The differences are most easily perceived when the investigation is made with reduced light. Glaring light somewhat drowns the differences. The duration of the erythropsia is for several minutes, according to the intensity of the preliminary and subsequent irradiation. It increases with the former and the less the latter is the longer is it perceptible. This hitherto unknown physiological phenomenon of erythropsia, which seems at first to contradict the law of the specific sense energy, greatly influences our power of color perception.

(*b*) Fuchs's theory, which hitherto has been considered valid, is disproved by the following experiment: After production of erythropsia all the light reaching the eye is filtered of all the red rays by means of a suitable apparatus and a solution of erioviridin. In spite of this the erythropsia persists. This cannot depend on the becoming visible of the visual purple, as assumed by Fuchs, for like any other body that is not self-luminous the purple needs red rays to render red visible.

(*c*) Vogt's experiment concerning the after-image of dazzling shows, (*a*) the red phase of the after-image with reacting light persists longer the longer fixation on the source of light has been maintained. (*b*) The red phase of the after-image with exclusion of light increases at first in duration with the longer continued fixation, then reaches a standstill, and is finally cut short. At the same time it is temporarily postponed and finally dominates through its after-images the perception of green, the so-called green vision. According to Vogt erythropsia is nothing else than a phase of the so-called after-image of dazzling. The preponderance of the red phase in the after-image of a white surface can be designated the first step of erythropsia. If the length of fixation and the intensity of the light are gradually increased the phase of red vision is gradually prolonged and typical erythropsia appears with change of the other phases of the after-image. The question of the nature of erythropsia is therefore identical with

that of the nature of the after-image. The curves of the after-image of a white surface constructed by Fechner and Wegener serve also for the after-image with erythropsia.

(*d*) The blue-green rays most easily produce erythropsia. It is very difficult, if not impossible, to produce it with red rays. After dazzling with red a slight blue vision takes its place. The blue is evidently to be considered as a component of the purple, the (spectral) red of which is exhausted. With the help of suitable absorption, yellow glasses and solutions showed the incorrectness of the view that the ultraviolet rays cause erythropsia.

(*e*) Persons who are red-green blind have erythropsia the same as those with normal vision. The red perception is rightly designated. Iridectomies, atropin, and aphakia predispose to erythropsia because of the greater amount of light entering the eye. In mydriasis this is about forty times greater than when the pupil is normal. Vogt also demonstrated a certain slight individual predisposition.

20. ROEMER (Greifswald)—**Specific treatment of commencing senile cataract.** After long study Roemer has now reached the practical result of his hypothesis concerning the origin of subcapsular senile cataract. If this form of cataract occurs through the specific cytotoxic action of products of metabolism upon the lens the first attempt should be, according to him, to combat this with the constituents of the lens. He states that an organic preparation has been made from the lenses of animals which contains the constituents of such lenses chemically unchanged; 165 patients with different forms of senile cataract have been fed for months with this preparation. As the protoplasm of the lens in mammals is of the same biochemic structure as in the human lens, the organism having cataract is compelled in this way to assimilate the same organic material that is affected in the cataractous eye. Cataracta punctata has thus far not been influenced in this manner, but in subcapsular cortical cataract, and also in many cases in which the punctate was combined with the subcapsular form, an improvement of vision has been demonstrated. These fluctuations of vision are certainly in part within the sources of error pertaining to this method of investigation, but in not a few cases the slow, positive increase of vision

was so marked that it cannot be explained in this way. The remedy has been placed officially in Roemer's sole charge for a more prolonged test.

21. BEST (Dresden)—**Pathological changes in the visual centre of the brain in cerebral blindness.** In a former work Best advanced the opinion that occasionally glycogenic infiltration of the brain produced functional injury of the affected regions. He met with a confirmation of his theory in a case of cerebral blindness with tumor of the cerebrum, in which the presence of glycogen was demonstrated on both sides in the brain substance of the cortex of the occipital lobes and particularly in the sheaths of the vessels.

FOURTH SCIENTIFIC SESSION, FRIDAY, AUGUST 7TH, HAAB (ZÜRICH) IN THE CHAIR.

22. WOLFRUM (Leipsic)—**Studies concerning the macula lutea in the higher mammals.** The fovea is larger in man than in monkeys through reduction of the ganglion cells and of the inner granular layer. The bending in of the limitans externa toward the vitreous in the region of the fovea is common to the higher mammals, so that the length of the cones is nearly doubled in monkeys. The individually varying size of the cones and the varying intervals between them can be first demonstrated after birth as in the newly born the cones are very plump formations. The development of the fovea begins about the seventh month of embryonal life and is not complete at birth. It is plausible that the development of the fovea, as it begins so late, may fail to take place, or may be arrested, while the other layers of the retina are much further advanced. This might explain congenital amblyopia, especially when associated with nystagmus.

23. STARGARDT (Strasburg)—**Pathology of adaptation to dark.** Stargardt has tried to demonstrate pathological processes in the formation of the visual purple in certain disturbances of the adaptation to dark. As according to Parinaud's theory hemeralopia in icterus is due to the solution of the visual purple by the salts retained in the blood, rabbits were made icteric by ligation of the common bile duct and killed after periods of adaptation to dark of varying length.

These retinæ were compared with those of normal animals that had been kept for an equal length of time in the dark and the result showed that even in the most icteric animal neither the quantity nor the rapidity of the formation of visual purple was in any way injured.

24. TEICH (Vienna)—**Experimental studies concerning the behavior of animal tissue in the vitreous of animals' eyes.** These experiments, which require a special technique, were undertaken in the following order. 1. Introduction of sterile, normal, homogeneous tissue, *i. e.*, tissue taken from rabbits, such as portions of the liver, spleen, kidney, muscle, brain, optic nerve, iris, and ciliary body. 2. Introduction of sterile, normal, heterogeneous particles of tissue from man, calf, pig, and dog. 3. Introduction of sterile emulsions of tissue, liver, spleen, kidney, muscle, iris, and ciliary body, by means of a specially-constructed apparatus. 4. Introduction of pieces of tissue that had undergone inflammation. Half of the material used for introduction was placed immediately in nutritive bouillon and only those experiments were taken into account in which the control proved to be truly sterile. The result showed that even positively sterile portions of animal tissue introduced into the vitreous of a rabbit's eye causes inflammation, either serous or seropurulent according to the nature of the tissue and the form of introduction. The rendering innocuous of the implanted tissue elements takes place as in other portions of the body, partly by removal by phagocytosis, partly by encapsulation, or through extrusion with the help of a purulent exudate. Pathologically changed tissue, or tissue artificially rendered inflammatory and then introduced, caused symptoms of reaction analogous to those produced by the normal pieces of tissue. In no case was a plastic iridocyclitis set up.

25. SALZER (Munich)—**Experimental contributions to the question of keratoplasty.** Since the author has maintained the view that in transplantation of the cornea, analogously with that of all other tissues, a gradual replacement of the transplanted flap takes place through the entrance of elements from the neighborhood and that this explains both the regular mishaps attendant on total keratoplasty in cases of total adherent leucomata and also the maintained clearness of the

flaps in partial keratoplasty and in total in clear animal corneas, our knowledge concerning transplantation has become broader. But the overwhelming majority of successful transplantations of the thyroid, ovary, and breast, are cases of autoplasty, simple displacement in the same individual, while homoplasty is much less promising, and the possibility of a successful heteroplasty can be looked for only in the lower species of animals. Hence it is physiologically impossible that the cornea of a rabbit can be transplanted into the eye of a man and preserve its structure. According to the results of Fuchs and Zirm, the use of human cornea evidently affords better chances for the preservation of large portions of the flap. But neither author dealt with total adherent leucoma but only with cases in which the deep layers of the cornea were more or less preserved. Such cases have already been paralleled by the author in his experiments on the clear cornea of animals. He believes that in such cases the less dangerous keratoplasty of v. Hippel can give just as good results, especially when it can be done with cornea from a human infant.

The author mentions his earlier experiments in partial keratoplasty which he finally gave up because with few exceptions the flaps melted away in spite of all care. The regeneration of the cornea was observed in the defects that were left behind. Superficial defects became filled with epithelium and the regeneration of the superficial layers of the cornea was extremely slow. On the contrary, when Descemet's membrane was injured the endothelial cells developed a very lively and rapid regenerative proliferation. In the only successful case of partial keratoplasty, the author could demonstrate the destruction of nuclei in the margin of the flap and a slight proliferation of the corneal corpuscles in the neighborhood.

Meanwhile Ribbert has overcome the difficulties of the technique and implanted flaps from guinea-pigs in pocket wounds in the corneæ of rabbits. Although the flaps remain clinically clear, destruction of nuclei and replacement by rabbit cells is shown microscopically. The author, using Ribbert's technique, repeated his former experiment and implanted the lining membrane of eggs. When no suppuration followed, the membranes lay for many months in the scarcely changed cor-

nea with only single vessels extending to the membranes. Microscopically vessels and abundant cells were present in the membranes. The nuclei of the cornea were notably increased, the inwandering cells came for the most part from the blood-vessels, partly from the corneal corpuscles. The membranes are very slowly "digested" by the cells. After 4½ months there was still scarcely any clinical change.

This experiment shows that dead organic material can heal into the cornea just as well clinically as a corneal flap.

Flaps from young rabbits, thus from the same species, were also implanted. Although at the end of two months the flaps remained almost perfectly transparent they exhibited very great changes microscopically. At the margins the epithelium had formed cysts which entirely displaced a portion of the flap. Elsewhere the flap was completely fused with the tissue filling the angle of the wound, or with the two lamellæ of the wound. Large portions were without nuclei, into others corneal cells had migrated. Signs of inflammation were entirely wanting. Descemet's membrane was frequently folded and greatly shortened, the fibrillæ bent through each other, swollen and running into each other, so that the main part of the flap appeared much more compact than its surroundings.

In one case the healing was imperfect, yet after fourteen days the eye was without irritation and the flap partially transparent. The microscope showed in addition to the epithelial cyst on the anterior surface a granulation from behind penetrating the otherwise well-preserved flap. The first cases show that in spite of clinical clearness of the flap very great changes take place in it.

26. IGERSHEIMER (Heidelberg)—**Experimental studies concerning the action of atoxyl upon the eye.** The relatively large number of cases of more or less marked loss of sight after the administration of atoxyl led the author to study the pathogenesis of atoxyl amblyopia experimentally. The experiments are divided into (1) local application of the poison to the eyes of 11 rabbits; (2) subcutaneous injection in 7 dogs and 7 cats. (1) Injections into the anterior chamber induced no permanent pathological condition. On the contrary injections of *1mg* or more of atoxyl into the vitreous induced serious

macroscopic and microscopic changes. But even when the ophthalmoscopic condition was normal, after the injection of a tenth of a milligramme, a commencing degeneration in the ganglion cells and optic nerve was present, an evidence that even in small doses atoxyl produces a necrotic action upon the nervous elements of the retina on direct contact. (2) While dogs exhibited very few general symptoms, cats always exhibited slowness of movements, ataxia, spasms, and spastic parapareses. Nothing pathological could be detected in the eye with the exception of frequent conjunctivitis and a single toxic anomaly of the pupil. But the pathological examination revealed positive changes, though not of high degree, in the ganglion cells of the retina, such as chromatolysis, shrivelling of nuclei, and destruction of cells, and a remarkable process in the optic nerve. The change was that denominated by Schreiber "Marchi-reaction" and characterized by intensive black staining of the medullary sheaths. Histological study of the central and peripheral nervous system revealed serious cell changes in the brain and spinal cord and a moderate Marchi degeneration in the peripheral nerves. It remains uncertain in regard to the primary point of attack of atoxyl whether the cell degeneration in the central nervous system and in the retina is a co-ordinate process, as the positive results of the vitreous injections would indicate, or whether the optic nerve and retina degenerate secondarily, which seems probable from the quantitatively much more marked process in the central organ.

Discussion.

Dor (Lyons), v. Kruedener (Riga), and Wolfrum, (Leipsic) reported cases of loss of sight after administration of atoxyl.

27. Wessely (Wuerzburg)—**Studies concerning the epithelium of the eye.** The object of Wessely's investigations was to determine whether Fischer's injections of scarlet red or of Soudan oil would induce proliferation of other epithelium than that of the skin of rabbits. He used for this purpose the epithelium of the eye and of its adnexa. While the scarlet oil injections gave a negative result in the cornea and caused

only unimportant changes, such as small iris cysts, when injected into the anterior chamber they induced extensive proliferations in the conjunctival epithelium, particularly in the two places where the cylindric conjunctival epithelium carrying goblet cells passes over into pavement epithelium, near the canthus and near the margin of the cornea. Although the oil was spread pretty uniformly beneath the conjunctiva throughout its extent, proliferations of epithelium appeared nowhere else, the connective tissue alone showed proliferation and formations of cells either epitheloid or resembling giant cells. The peculiarity of the transition places from one kind of epithelium to another which, as we know from pathology, are particularly prone to proliferation, seems to furnish a new point of view for the consideration of the mode of action of scarlet oil. The Meibomian glands showed epithelial proliferation springing from their excretory ducts, while the epithelium of the lachrymal gland did not react.

28. FLEISCHER (Tuebingen)—**Cytological studies of the cerebrospinal fluid in patients with eye disease.** The author has tried to answer the question whether the cytological examination of the cerebrospinal fluid is of value in ophthalmology, particularly in the differential diagnosis of syphilitic affections. He starts from the fact that in a certain percentage of persons formerly infected with syphilis a lymphocytosis of the cerebrospinal fluid is to be found even without the presence of nervous symptoms. For confirmation of the diagnosis the majority of the cases were also tested for syphilis by Wassermann's method. He examined 33 cases. In 11 syphilis was certainly present and in all the cytological investigation gave a positive result, in 5 cases in which syphilis was only suspected the result was also positive, in the remaining 17 cases which presented no traces of syphilis a positive result was obtained nine times. This test is therefore not useful in the differential diagnosis of syphilitic eye diseases, because a lymphocytosis of the cerebrospinal fluid may be present in inflammatory diseases of the eye not syphilitic in nature. On the contrary, the serum diagnosis of Wassermann is reliable and to be recommended in ophthalmology.

29. LOHMANN (Munich)—**The question of convergence or accommodation contraction of the pupils in the position for**

near. In the report of a case of a convergence rigidity of the pupil with post-diphtheritic paralysis of the accommodation, the author discusses the question whether the contraction of the pupil in the position for near is associated with the accommodation, the accommodation and convergence combined, or is wholly dependent on the convergence. He gives a simple modification of Hering's experiment which weakens the objections that have been urged against it, and by maintaining the position of the eye in the way devised by Hering he was able to change the accommodation and at the same time observe objectively the behavior of the pupil. In his experiments he found fluctuations in the size of the pupil of about o.6*mm*, a degree which could have occurred only with great fluctuations of convergence, that were not present in the experiment. If extensive change of the accommodation alone causes a pupillary change, this does not appear to be the case in slight changes of the accommodation which lie in or near the field of the relative range of accommodation. Vervoort's experiment shows that the accommodation can be slipped out of the triad convergence, accommodation, and pupillary contraction without the size of the pupil corresponding to a certain position undergoing any change. A voluntary separation of the convergence from the triad is less easy than of the accommodation. In prism experiments there is not a true change of convergence, yet the size of the pupillary change thus produced speaks practically in favor of the dominating influence of the convergence upon the size of the pupil.

Lohmann concludes that the contraction of the pupil is associated with both the accommodation and the convergence by means of an internuclear connection between the nucleus of the sphincter and the accommodation or convergence centre. There might be only a partial connection so far as the accommodation is concerned. The accommodation maintains in its connection with the convergence a certain independence, relative range of accommodation. Perhaps individual differences exist in this connection. They would explain how Wlotzka in his experiments obtained no contraction of the pupil even with great fluctuations of the accommodation. Perhaps also this theory of an individual fluctuation of the synergetic connection between the position for near and

the accommodation could explain the case of convergence rigidity mentioned in the beginning.

30. Polack (Paris)—**Remy's diploscope.** Polack showed that some faults had entered into the construction of the diploscope because too much reliance had been placed on empiricism and too little on geometric calculations. Three given dimensions are necessary in order that the diploscope be exactly accurate, namely the length of the axis, that of the base line, and the position of the screen upon the axis. The other elements are then easily corrected by calculation. The openings in the screen should have a considerably larger diameter than the large test types when the diploscope is constructed with a fixed base. Such an instrument offers inconveniences, particularly in the treatment of strabismus, for according as its base line is greater or smaller than the pupillary distance of the patient it forms stereoscopic or pseudoscopic images. This can be avoided by making the base of the instrument movable. But this is impracticable with the large diploscope, in which the openings in the screen should be made oblique. This is done according to geometrical calculations by means of a small trapezium-shaped optic contrivance introduced into the apparatus, the base line of which is directed forward and upon which a perforated extensible screen can be moved. A scale shows the size of the base line at any time. With this device the apparatus can be adjusted to any pupillary distance, and the latter can be determined with the apparatus itself by means of a special test chart. It is to be hoped that this modification may facilitate the use of Remy's diploscope in the treatment and investigation of strabismus.

31. Chevallereau (Paris)—**Combined transverse keratotomy.** This operation consists of a section of the cornea through the entire extent of its transverse meridian combined with removal of the iris and lens without touching the choroid and retina. It is indicated in definitely lost, deformed, or painful eyes. If the section is made in the manner described, the cornea slowly becomes smaller but maintains its circular form until it has finally shrunken almost to a point. The entire globe also becomes smaller without losing its globular shape. Several weeks elapse before the final result is at-

tained. The operation is indicated in all cases in which the presence of the cornea forms an obstacle to the wearing of an artificial eye, such as staphyloma, buphthalmos, absolute or secondary glaucoma. It gives immediate relief to pain and an excellent cosmetic result.

32. ADAM (Berlin)—**A new method of treatment of the blennorrhœa of adults.** Adam reports the results he has obtained from the rubbing into the eyes at intervals of two hours, later at longer intervals, an ointment of lenicet in vaseline, the melting point of which is raised by means of ceresin. The lenicet diminishes the secretion, the vaseline protects the cornea. The vaseline, called euvaseline, can also be used to advantage in operations for ptosis, plastics, and lagophthalmos. The writer has used this method in twenty-four adult eyes and seen permanent injury of the cornea in only five.

33. HARMS (Tuebingen)—**Peripapillary preretinal hemorrhage.** Harms saw clinically two cases of large hemorrhages about the papilla which covered the blood-vessels, and studied a third similar case anatomically. He found an extensive hemorrhage about the papilla between the limitans interna retinæ and the posterior basal membrane of the detached vitreous. In the region of this preretinal hemorrhage, and also outside of the same, there were several spindle-shaped hemorrhages between the detached limitans interna and the layer of nerve fibres of the retina, which he designates as intraretinal hemorrhages of preretinal character. From such a peripapillary preretinal hemorrhage alone can arise, in the opinion of the author, the peculiar fundus picture shown in Jaeger's Hand Atlas as the first published case of so-called retinitis proliferans. The great rarity of both conditions agrees well with this view.

34. LEVINSOHN (Berlin)—**The cortical centres of eye movements according to experiments on monkeys.** The author comes to the following conclusions after numerous experiments on the cortex of fifteen monkeys:

I. The central innervation of the ocular movements has a very great extent in monkeys. It is chiefly found in the posterior part of the frontal lobe, the angular gyrus, and the occipital lobe. Certain foci were localized in each of these parts at which both a purely lateral movement and one asso-

ciated with deviation upward or downward could be excited. Although the position of these foci is fairly constant, yet it is not possible to state it as certain in any particular case.

II. The greatest degree of excitability is to be found in a little place situated directly in front of the curvature of the sulcus præcentralis, then follows the occipital lobe, and finally the angular gyrus. The ability to excite movements of the eye in each of these portions of the brain is independent of that of the others, for it is present in each after excision of the others. The movements of the eye are therefore not under the control of association, but of cortico-fugal tracts.

III. The movement of the eye on stimulation of the cortex is primarily by means of active contraction of the stimulated muscle, the resistance of the antagonist in lateral movement is of only secondary importance.

IV. It was impossible by exclusion of the lateral movements by excisions of the cortical parts chiefly governing the laterally moving muscles to induce by cortical stimulation vertical deviations of the eye.

V. The symptoms of loss following extirpation of the portions of the cortex involved in movements of the eye are almost completely negative. After extirpation of one, several, or all of these parts there is a conjugate deviation which very soon disappears. The ability to turn the eyes laterally remains unimpaired.

VI. The portion of the cortex in front of the sulcus præcentralis must be considered the cortical seat of eye movements par excellence and the others rather as secondary, because after extirpation of the angular gyrus there is a reduction of the sensibility of the opposite eye and of its surroundings, after extirpation of the occipital lobe hemianopsia appears, while extirpation of this area is negative. As after extirpation of one or all of these parts the eye maintains its normal position and is able to move, it follows that in monkeys the cortex cerebri is without any real influence on the position or the motility of the eye.

REPORT OF MEETING OF THE SECTION ON OPHTHALMOLOGY OF THE NEW YORK ACADEMY OF MEDICINE.

By Dr. H. W. WOOTTON, Secretary.

MONDAY, OCTOBER 19, 1908. DR. W. E. LAMBERT, PRESIDENT, IN THE CHAIR.

Present, 20 members.

Dr. John R. Shannon presented a case of **plastic choroiditis.**

The patient was a baby four and one-half months old, who was seen by Dr. Shannon first at the age of five weeks. The father had noticed that the eyes were not normal the day after the baby was born, and there was apparent, when it was first brought to the hospital, a bright grayish reflection from the interior of both eyes which could be seen very readily by reflected light. The intra-ocular growths were marked by a number of blood-vessels which coursed over their surface and they strongly resembled gliomata. The tension of the eyeballs was minus, and the anterior chamber almost obliterated. The diagnosis of pseudo-glioma was made largely from the family history, which proved most interesting. The father is twenty-nine years of age, the mother twenty-four; both are healthy, and there is no history of tuberculosis or syphilis. They were married in 1904, and the first-born child, the patient presented, was born in May, 1905. When five days old, it was noticed that his eyes were not right, and he was taken to various clinics, but nothing in the way of treatment was suggested or attempted and the process of ocular atrophy became established as it is at the present time. The second son was born in August, 1906, and the

disease in his eyes was noticed on the sixth day. He was seen by many ophthalmologists, including Dr. Posey, of Philadelphia, who referred the case to Dr. Shannon with a letter describing it as one of phthisis bulbi, probably from intra-ocular disease, which, however, could not be made out surely on account of dense leucomata of the cornea. Dr. Shannon never saw this child, as shortly after returning from Philadelphia to Brooklyn, where the parents reside, the child was attacked by scarlet fever and died.

Extending his inquiries into the family history, Dr. Shannon discovered that the mother of these children has three brothers, two of whom he has been able to examine. The eldest has normal eyes, and is a well-developed young man. The second is blind, apparently from the same process exhibited in these other patients. Dr. Shannon saw him recently and found atrophia bulbi with dense opacities of the cornea, the eyeballs being very soft to the touch. The boy is said to be bright, but his intelligence seemed to Dr. Shannon to be of that uncanny type sometimes observed in children of feeble mentality. The third brother is an idiot and blind—the condition of the eyes being described as the same as that found in the others of the family affected. There are also three sisters of this mother, one of whom is married, and the eyes of all these—and of the children of the married sister, both boys and girls—are reported to be excellent.

This condition, while generally described as a plastic or exudative choroiditis, is believed by Treacher Collins, who has examined a number of cases—one at four days of age—under the microscope, to begin as a retinitis, the inflammation extending to the choroid, ciliary body, and iris. Parsons mentions as a cause of this condition the acute infectious diseases, but obviously this could not apply in the cases which Dr. Shannon has reported, which are without doubt congenital. Collins thinks they may owe their origin to meningitis, the inflammation spreading down the sheath of the optic nerve; but Dr. Shannon has been unable to find any history of inflammatory symptoms referable to the head in any of these cases, unless, indeed, it were intra-uterine. While the diagnosis presented little difficulty, the etiology, it will be seen, is very obscure.

Dr. E. L. OATMAN presented a case of **tuberculous chorio-retinitis.**

The patient was seen for the first time on June 19, 1908. She was an unmarried woman, twenty-two years of age. One brother had incipient phthisis. She presented evidence of pulmonary disease, although tubercle bacilli were not demonstrated in the sputum. Had occipital headaches. O.D. vision, hand movements at two feet; tension normal; no evidence of disease in cornea, iris, or ciliary body; vitreous very cloudy and filled with floating webs; fundus reflex, dull red except a limited area on temporal side which was brilliant white. Elevation of fundus at this point could not be determined owing to opacity of vitreous. From the physical condition of patient and entire absence of anterior uveitis, a probable diagnosis of tuberculous choroiditis was made. Mercurial inunctions were used for three weeks, the patient in the meantime steadily growing worse. She had suddenly appearing headaches lasting for hours. Suffered from hacking cough with progressive loss of flesh and appetite. Mercurial inunctions were discontinued and tuberculin treatment begun. The T. R. was given hypodermically with intervals of two days between injections. The initial dose was 1:1000*mg*, which was increased by 1:1000*mg* at each subsequent injection, until dose of 1:250*mg* was reached. Improvement in health and vision was soon manifested but patient developed an acute melancholia with suicidal tendency. After the sixth injection, tuberculin was discontinued for two weeks. During this interval, the melancholia subsided. The headache, however, became worse and vision failed. On resuming tuberculin injections, improvement again took place and has continued without interruption to the present time (October 19th). Body weight has increased thirteen and one-half pounds; vision, O.D. $\frac{20}{30}$.

When the fundus first became ophthalmoscopically visible the diseased area was seen as a large white patch, situated just above and to the temporal side of macula. The central elevation was about 1.5 dioptres. This was surrounded by a number of smaller, nummular patches, some of which appeared to be formed by exudate and others by depigmentation of the retinal epithelium. The small and large patches tended to

fuse. A few masses of retinal pigment were scattered immediately beyond the borders of the diseased area, but of choroidal pigment heaping there was no trace. At the present time, the ophthalmoscopic appearance indicates a cicatrizing process beneath the retinal vessels but not below the choroid, as choroidal vessels can be seen. From this it is assumed that there has been infiltration of the inner layers of the choroid or outer layers of the retina.

Dr. Oatman, in closing, said: Although a positive diagnosis was not made in his case, nevertheless, the probability of a tuberculous origin was indicated by the physical condition of the patient, and also by improvement under tuberculin injections and relapse when they were interrupted. The fundus lesion occupied a circumscribed area and was devoid of choroidal pigment heaping. Such pigment as existed was above the retinal vessels. Krauss and Brueckner have called attention to the scarcity of choroidal pigment deposits in tuberculous chorio-retinitis. In a measure, this may be due to destruction of the chromophores by the tuberculous process, as Dr. Oatman has sometimes observed in cases of advanced conglomerate tubercle. Formerly, cases of exudative choroiditis have been attributed to syphilis, or else have been supplied with a name but not with an etiology or pathology. Perhaps in the future, syphilis will divide with tuberculosis the responsibility for many obscure cases of choroiditis.

Dr. E. L. Oatman also presented a case of **corneal fistula** on which he had operated about a year ago by closing the fistula with a sliding conjunctival flap. The appearance of the eye was excellent, the flap having withered and disappeared. The greater part of the cornea was left transparent.

Dr. R. G. Reese presented the following cases:

Case 1. A man twenty-six years old had the eye destroyed by lime. The upper cul-de-sac was entirely obliterated, with some cicatricial bands running into the lower sac. Dr. Reese restored the sac by means of a Wolfe graft after Weeks' method. He presented the case six months after the operation, and the patient wore a large artificial eye.

Case 2. A man twenty-one years old came to Cornell with no history of injury, but Dr. Reese noted slight siderosis. A skiagraph was taken, and a foreign body was located 8.5*mm*

back of the centre of the cornea, and 7.5*mm* below the horizontal plane. Dr. Reese drew the foreign body through the suspensory ligament into the posterior chamber with the giant magnet. It became entangled in the iris, so that he could not get it into the anterior chamber. He then made a corneo-scleral section downward with a keratome, pulled the iris out of the opening with a forceps, and removed the iron from its posterior surface with a small magnet. He replaced the iris with a spatula. Patient has perfectly round, central pupil with normal vision ($\frac{20}{20}$). After two weeks siderosis disappeared.

Case 3. A man forty-five years old. Skiagraph showed a foreign body 4*mm* back of centre of cornea and 2*mm* above the horizontal plane. Dr. Reese used the Sweet magnet but could not draw the foreign body into the anterior chamber. He proceeded as in Case 2, and removed the piece of iron, which weighed .7*mg*. Patient has perfectly round, central pupil, with $\frac{20}{30}$ vision.

Case 4. A man twenty years old had a soft cataract, O.D. Skiagraph showed foreign body in the centre of the lens. Dr. Reese did a linear extraction, and removed the piece of iron with the Sweet magnet. Patient has $\frac{20}{30}$ with +11 D. Sph., central, round pupil.

Dr. J. E. Weeks reported a case as follows:

In April, 1907, while striking a steel wedge with a power hammer, a piece of steel flew into the patient's left eye and was not recovered. There was only slight reaction from the injury. The following July his vision was reported to be the same as that of the other eye. The patient continued to work until December, 1907, when a piece of steel entered the right eye. Dr. Quackenbos of Boston removed the right eye five days later. The patient soon resumed work, the vision of the left eye remaining, as he believes, normal. About the middle of last June an artificial eye was inserted. Within two weeks he began to feel discomfort in the left eye, as though a foreign body were in it. He continued to wear the eye about two weeks more, when the condition of the left eye became so bad that he sought treatment, coming under the care of Dr. Wakefield. The media were then so hazy that no details of the fundus could be made out. There was marked circum-

corneal injection, the iris was cloudy, and the pupillary space partially filled with points of exudate, remnants of which are still seen. Tension —1. The stump of the enucleated eye was sensitive and the conjunctiva was discharging pus. Sterilization of the conjunctival sac, permanent discontinuance of the artificial eye, and mercurial inunctions were advised. He was already receiving boric-acid applications with atropin instillations.

Vision improved until on September 21st it was $\frac{20}{50}$ minus through a stenopæic slit. The sensitiveness of the right stump had practically disappeared.

Dr. Hartshorn, who had charge of the patient at the time of his second injury, thought that there was a foreign body in the left eye, and in consultation with Dr. Quackenbos of Boston had skiagraphs taken. The measurements secured, based on a 24*mm* globe, located the foreign body just outside of the eyeball. Relying upon these measurements, no attempt was made to remove the foreign body.

When seen by Dr. Weeks, the left globe showed marked siderosis. Vision $\frac{20}{100}$. Pupil moderately dilated. Iris dirty brownish color. Reaction very sluggish. A number of small spots of brownish pigmentation on anterior and posterior surfaces of lens capsule. Lens transparent. Dust-like opacities in the vitreous. Details of fundus very hazy. Mass of exudate at the periphery below. Field of vision limited concentrically; more pronounced above. T. $-\frac{1}{2}$. Slight circumcorneal injection. No pain. Although a foreign body was thought to be present in the mass of exudate in the lower part of the eyeball, it could not be seen.

Skiagraphs were taken at the Infirmary by Mr. Burchell and a small foreign body was located in the eyeball, lying near the ora serrata below. The question of the advisability of attempting to remove the foreign body, even if it was in the eyeball, because of its probable encapsulation and the effect of traction on the position of the retina and subsequently on vision, had been raised by the physicians previously in charge. The objections were overruled on the grounds of inevitable blindness if the foreign body was not removed, and on the records of similar cases (Hirschberg, Haab, and others) and the experience of the writer.

On applying the giant (Haab) magnet, the piece of steel, after some trials, was drawn into the posterior chamber, lodging at the root of the iris. As it was impossible to bring the piece of steel into the anterior chamber through the pupil, an incision through the cornea and iris at the limbus was made and on application of the small magnet the piece of steel was removed. It measured approximately 1½*mm* square by ½*mm* thick. Its surfaces were oxidized. Very little traumatism was inflicted. The patient made an uneventful recovery and returned home two weeks after the operation with vision and visual fields as when he came.

The questions of importance that this case raises are:

1. The necessity of the early removal of pieces of steel that enter the eyeball.
2. The importance of exact location by skiagraphy.
3. The influence and importance of exudation that forms about pieces of steel, and the danger, if any, of late removal.

In the discussion of Dr. Oatman's case, Dr. J. E. WEEKS thought we should be very careful in diagnosticating tuberculous affections simply on account of recovery following the use of tuberculin of low potency. He had seen cases like Dr. Oatman's get well without tuberculin, and it was hard to conceive of a tuberculous process without elevation of the exudate. Elevation was not distinctly present in Dr. Oatman's case. In his opinion, the diagnosis of tuberculosis was not conclusive.

Dr. W. P. MARPLE cited Dr. C. S. Bull's cases in which recovery from the eye lesions under the use of tuberculin had been followed by tuberculosis of the lungs. Dr. Oatman's case resembled one he had recently seen, and which was undoubtedly an ordinary exudative choroiditis.

Dr. E. L. OATMAN, in reply, stated that the tuberculous history of the patient was in favor of the diagnosis. Also, the employment of mercury was not followed by improvement, while the improvement following the use of tuberculin had been marked and rapid. There was no elevation at present because the exudate was subsiding. There was no deposit of choroidal pigment around the margins of the exudate. In choroiditis, when cicatrization took place, some

deposit of choroidal pigment was generally visible. There was practically no retinitis. Of course, we cannot be absolutely certain about these cases, but he was of the opinion that many cases of non-syphilitic choroiditis would in the future turn out to be tuberculous.

In the discussion of Dr. Reese's case of restoration of the cul-de-sac, Dr. J. E. WEEKS thought the result a very beautiful one. He had so far performed this operation twenty times and wished to report a failure, his last case. The flap was taken from the leg and the lower cul-de-sac restored. Two weeks later he operated upon the upper lid. The flap took fairly well, but one or two points sloughed. Shrinkage, however set in above and below until, at the end of six weeks, an artificial eye could not be worn. The patient was pale and the skin was flabby, more flaccid on the legs than on the arms. He thought there were undoubtedly certain cases in which success was next to impossible, no matter what method was employed.

Dr. E. L. OATMAN inquired about the odor and accumulation of epithelial detritus so often observed in these cases.

Dr. R. G. REESE replied that in this case the patient had been bothered by neither of these conditions.

There was no discussion upon Dr. Reese's cases of foreign body in the vitreous, nor upon the case reported by Dr. Weeks.

In the discussion of Dr. Shannon's case, Dr. J. E. WEEKS stated that the condition of the iris and anterior chamber would almost alone lead one to diagnosticate inflammation and not glioma. In glioma, the iris was not, in the earlier stages at least, glued down to the anterior capsule of the lens. This condition was present in Dr. Shannon's case, and settled the diagnosis.

Dr. J. H. CLAIBORNE read a paper entitled **A case of retrobulbar optic neuritis.**

Dr. Claiborne began his paper with the report of a case: A healthy woman of forty-five awoke one morning, and found something indefinite the matter with her left eye. A week or more afterward, she found that the vision of the left eye was quite dim. After this condition had persisted for three

weeks, she concluded to get medical advice. Dr. Claiborne saw her about one month after she had observed the dimness of sight. She had always lived an outdoor life, was a widow, and had one child. Pupil and tension normal. Small linear opacity of the lens, which appeared to be of long standing. The optic disk was blurred, and the nerve slightly swollen; both arteries and veins were swollen, the latter particularly so. There was, in short, a mild optic neuritis. Field normal, except upwards, where it was contracted. Central field for colors slightly modified. She recognized red, but called green blue. The vision was $\frac{20}{200}$.

The night before she had remarked the dimness of vision, she had washed her hair and slept in a draught. The eyes felt stiff, and it pained her to move them in the sockets. This symptom, however, passed in a day or so. No headache; no symptom of acute cold. Had not had any trouble with her nose or accessory sinuses. She complained of an ill-defined scotoma upwards, which persisted as long as she was under treatment. Treatment was kept up, and patient was put on K. I., the dosage running up to 175 grs. t.i.d. At the end of a month her sight had risen to $\frac{20}{30}$. The optic neuritis gradually got better *pari passu* with the improvement in her sight. Dr. Claiborne could not persuade himself that there was any pallor of the nerve, either temporally or in general. When she left for home, the fundus was normal in all respects.

The history of this case is classical, except, perhaps, the absence of the usual slight dilatation of the pupil and the strongly marked central scotoma for both green and red. Green is usually called gray by those who have a central scotoma, whereas it was called blue in this case. It is possible that Dr. Claiborne would have observed a sluggish pupil also, had he seen her in the first place. There was no tenderness on pressure upon the ball, but this is usually a symptom of the acute stage and it is not surprising that it was not present.

The text-books are singularly barren in their descriptions of retrobulbar optic neuritis. All those which describe it divide the causes in general into two kinds—systemic and local—the latter due to extension from the accessory sinuses, the sphenoid, the ethmoid, the antrum, and frontal. Some

state also that it may arise from a simple rhinitis. Under these circumstances the diagnosis is generally made, for it is a simple thing to refer a papillitis occurring in conjunction with contiguous sinus trouble to the latter as the cause. In the great majority of cases, however, the examination of the central color perception is not made, and the case is generally dismissed as a neuro-retinitis. The majority of cases of neuro-retinitis following grip have been ascribed to the grip, but they have not been called acute retrobulbar optic neuritis. The evanescent character of the complication should mark its difference from the ordinary neuro-retinitis. All authorities agree that it may be caused by cold without other complications, but Bull also cites gout, rheumatism, syphilis, typhoid fever, carcinoma of the stomach, lead poisoning, diabetes, and one case that occurred after the sting of a scorpion. Tuberculosis is also cited as a cause. Fuchs says "an idiopathic inflammation of the optic nerve is supposed to exist in disseminated sclerosis, in which retrobulbar optic neuritis often occurs as an early symptom." The prognosis is, in general, good, particularly in the idiopathic form, but, of course, in the secondary form, it depends somewhat upon the inflammation of the contiguous sinus from which it is propagated. Blindness has been reported and, at times, a persistent central scotoma for green or red or both, or an absolute central scotoma remains. When the latter occurs the usual triangular patch of atrophy to the outer side of the nerve appears, and the finale in this respect exactly resembles that of the tobacco-alcohol amblyopia. Parsons and de Schweinitz both say that at times there is a slight degeneration of the ganglion cells of the retina.

Dr. Claiborne thought that his case was undoubtedly due to cold, and he was strongly inclined to think that all cases that occur after taking cold are caused by the extension of the inflammation from the nasal mucous membrane. Although his patient did not have a cold in the head, it is highly probable that sleeping in a draught with the hair wet caused acute rhinitis. Those cases which occur in typhoid fever, tuberculosis, syphilis, rheumatism, lead poisoning, etc., can only be attributed to the systematic effect of the poison in each case, as in tobacco-alcohol amblyopia, except that the course in the

former is often rapid and the symptoms appear suddenly, whereas in the latter, it is slow and chronic.

In contemplating the whole subject, however, it is difficult to resist the suspicion that all cases, even of retrobulbar optic neuritis due to systemic poison, have a beginning that is very similar to the onset of acute retrobulbar optic neuritis. If this suspicion be correct, acute retrobulbar optic neuritis is simply the beginning of an inflammation which becomes quickly resolved, and does not go on to the chronic form. This idea is further supported by the facts that, at times, there is atrophy of the papillo-macular bundle of nerve fibres following the acute form, and that the central scotoma for colors often disappears in the chronic form. Though we do not see a true papillitis in the toxic form as in tobacco-alcohol amblyopia, yet we do frequently see intense congestion of the disk. While he did not think that definite conclusions were justifiable, Dr. Claiborne summed up his views as follows:

1. Acute retrobulbar optic neuritis may occur: (*a*) As an extension of an acute inflammation from the nasal mucous membrane or the contiguous sinuses. (*b*) As the result of intoxication of the general system from various causes.

2. The acute optic neuritis which follows grip and is usually recorded in these terms is probably acute retrobulbar optic neuritis, and is caused either by an extension of inflammation by continuity from the Schneiderian membrane, which is always involved, or by systemic infection, or by a combination of both.

3. While the symptom complex of acute retrobulbar optic neuritis is well-marked and is entitled to individual recognition, its relationship to the chronic form known under the name of retrobulbar optic neuritis or toxic amblyopia appears not to be definitely defined, and further research is necessary to define that relationship.

In the discussion of Dr. Claiborne's paper, Dr. E. L. MEIERHOF stated that, in considering the relation between disease of the optic nerve and that of the nose and accessory sinuses to optic neuritis, he had examined many cases, but thought that the number of cases of optic neuritis following sinusitis was very small. The explanation of obscure cases of optic

neuritis by this cause would be very pleasant indeed, and we should always search for sinus trouble in all obscure inflammations of the optic nerve. The cases that occurred with grip gave a favorable prognosis, even when treatment of the nose was not instituted.

SYSTEMATIC REPORT ON THE PROGRESS OF OPHTHALMOLOGY IN THE FOURTH QUARTER OF THE YEAR 1907.

By Dr. G. ABELSDORFF, in Berlin; Prof. ST. BERNHEIMER, in Innsbruck; Dr. O. BRECHT, Prof. R. GREEFF, Prof. C. HORSTMANN, and Dr. R. SCHWEIGGER, in Berlin; with the assistance of Prof. A. ALLING, New Haven; Prof. E. BERGER, Paris; Prof. CIRINCIONE, Genoa; Dr. DALÉN, Stockholm; Prof. HIRSCHMANN, Charcow; Dr. J. JITTA, Amsterdam; Mr. C. DEVEREUX MARSHALL, London; Dr. H. MEYER, Brandenburg; Dr. P. VON MITTELSTÄDT, Metz; Dr. H. SCHULZ, Berlin; Prof. DA GAMA PINTO, Lisbon; and Others.

Translated by DR. MATTHIAS LANCKTON FOSTER.

Sections I.–III. Reviewed by Prof. C. HORSTMANN, Berlin.

I.—GENERAL OPHTHALMOLOGICAL LITERATURE.

442. CZERMAK, WILHELM. *Ophthalmological Operations.* Second enlarged edition by Anton Elschnig, Bd. i., part 2. Urban and Schwarzenberg, Berlin and Vienna, 1907.

443. LAGRANGE, F., and VALUDE E. *French Encyclopædia of Ophthalmology*, vol. vii. Paris, O. Doin, 1907.

The second part of the first volume of Elschnig's (442, **Ophthalmological operations**) work contains the operations on the lachrymal passages, the orbit, the ocular muscles, the accessory sinuses, and the soft parts. It is to be hoped that the appearance of the second volume of this excellent work will not be long delayed.

The seventh volume of the **French encyclopædia of ophthalmology** (**443**) by Lagrange and Valude begins with the diseases of the lens from the pens of Prof. Henri Dor (Lyons) and Louis Dor. It contains numerous personal experiences, some of which date back to the time when Prof. Dor was in charge of the University Ophthalmological clinic at Berne. With regard to the etiology of lamellar cataract the authors

reject the theories of Horner and v. Michel, who ascribe it to rickets, and refer it instead to a toxæmic origin. With regard to the etiology of senile cataract they agree with Roemer. The accompanying illustrations are taken in part from the works of O. Becker, Hess, Beselin, and Schirmer. This is decidedly one of the best of the large French compilations.

II.—GENERAL PATHOLOGY, DIAGNOSIS, AND TREATMENT.

444. Horn, Gustav. **Concerning dark adaptation in diseases of the fundus.** *Inaug. Diss.*, 1907, Wiesbaden, J. F. Bergmann.

445. Hanke, F., and Tertsch, B. **Some rare infections of the eye.** *Klin. Monatsbl. f. Augenheilkunde*, xlv., No. 6, p. 545.

446. Unna, W. **Pfeiffer's influenza bacillus the excitant of intra-ocular diseases.** *Klin. Monatsbl. f. Augenheilk.*, xlv., Beil., p. 283.

447. zur Nedden. **Studies concerning the occurrence of bactericide substances in the conjunctival sac, together with remarks concerning the healing process in conjunctival catarrh.** *Zeitsch. f. Augenheilkunde*, xviii., p. 300

448. Lindahl, C. **Contribution to the knowledge of the bactericidal action of the lachrymal fluid.** *Hygeia*, 1907, p. 353.

449. Fehr. **Disease of the optic nerve produced by atoxyl.** *Deutsche med. Wochenschrift*, 1907, No. 47.

450. Possek. **The thyroid gland and the eye.** *Klin. Monatsbl. f. Augenheilkunde*, xlv., Beil., p. 1.

451. Wernecke, Th. **The action of thyreotoxin on the eye.** *Ibid.*, p. 51.

452. Fortunati, A. **Picric acid in injuries of the eyes with chemicals, particularly lime.** *Annali di ottalmologia*, 1907, Fasc. 9, 1079.

453. Wirtz. **Contribution to the question of the relations between auto-intoxications and diseases of the eye.** *Med. Klinik*, 1907, No. 47.

454. Leber. **Concerning the biological specific diagnosis, particularly in syphilitic diseases of the eye.** *Med. Klin.*, 1907, No. 38.

455. Tribondeau and Belley. **Action of the X-rays upon the eye during development.** *Arch. d'electricite medicale, esperimentale et clinique*, Dec. 7, 1907.

456. Calmette, A. **Concerning the early diagnosis of tuberculosis by means of the reaction of the eye to tuberculin.** *Klinisch-therap. Wochenschrift*, 1907, No. 33.

457. Schenck and Seifert. **The diagnostic signification of the ophthalmo-reaction in tuberculosis.** *Muenchener med. Wochenschr.*, 1907, No. 46.

458. de Lapersonne, F. **Is the ophthalmo-reaction dangerous to the eye?** *La presse médicale*, 1907, No. 7.

459. Barbier. **Apropos of the ocular reaction to tuberculin.** *Soc. méd. des hôpitaux de Paris*, Dec. 6, 1907.

460. Stephenson, Sidney. **The Calmette serum reaction in ophthalmology.** *American Journal of Ophthalmology*, Nov., 1907.

461. BALDWIN, E. R. **The ophthalmo-tuberculin diagnostic test. Some clinical observations.** *Jour. Amer. Med. Association*, Dec. 14, 1907.

462. MACLENNAN, W. **Observations on the ophthalmo-reaction to tuberculin.** *British Medical Journal*, Dec. 7, 1907.

463. WEBSTER, J. S., and KILPATRICK. **Notes on 121 cases tested with Calmette's tuberculin.** *British Medical Journal*, Dec. 7, 1907.

464. KALT. **Aggravations of intraocular tubercular lesions by instillations in the conjunctival sac.** *Soc. d'ophtal. de Paris*, Oct. 8, and Nov. 5, 1907.

465. TRUC, H., and MAILLET, F. **Studies concerning the ophthalmo-reaction. Comparative reaction of dionin and tuberculin.** *Rev. gén. d'ophtalmologie*, xxvii., p. 481.

466. CHANTEMESSE. **The eye diagnosis in typhoid fever.** *Klin. ther. Wochenschrift*, 1907, No. 31.

467. KRAUS, LUXENBERGER, and RUSS. **Is the ophthalmo-reaction of Chantemesse useful for diagnostic purposes in typhoid fever?** *Wiener klin. Wochenschrift*, 1907, No. 45.

468. BALLABAN, TH. **Concerning the value of subconjunctival injections and its theory.** *Wiener klin. Wochenschrift*, 1907, No. 51.

469. ZIMMERMANN. **Percutaneous treatment with iodin.** *Ophthal. Klinik*, 1907, p. 673.

470. SCHIOETZ, H. **Tonometry.** *Hospitalstid.*, 1907, No. 844.

471. FRANK, M. **Magnetic and non-magnetic properties of iron alloys.** *Oph. Record*, Nov., 1907.

472. BEAL, RAYMOND. **Spontaneous bursting of an artificial eye with a double wall.** *Annales d'oculistique*, cxxxviii., p. 413.

473. VUELLERS. **New diagnostically important results from trans-illumination with Sachs's lamp.** *Zeitschrift f. Augenheilkunde*, xviii., p. 215.

474. BORSCHKE. **The theory of skiascopy.** *Arch. f. Augen.*, lviii., p. 292.

475. LEWIS. **Blindness following the injection of protargol in the lachrymal sac.** *Oph. Record*, Dec., 1907.

According to HORN (444, **Concerning dark adaptation in diseases of the fundus**), myopia even when of high degree causes no disturbance of adaptation. If any such disturbance is present, it must be referred to disturbances of nutrition not recognizable ophthalmoscopically. In congenital amblyopia there are marked disturbances of adaptation. Addition of stimulus is shown particularly clearly in strabismus. Serious disturbances of adaptation, regarding the height and time of adaptation and the character of the curve, are found in hemeralopia caused by chronic alcoholism, nephritis, diabetes without ophthalmoscopic changes, and in cases of

atypical retinitis pigmentosa. Marked changes of adaptation are present in chorioideal changes due to hereditary syphilis. Tabetic atrophy is associated with great disturbance of the adaptation. Severe optic neuritis may run its course without any disturbance of adaptation. Glaucoma causes a very marked lowering of the adaptation. The adaptation suffers in fresh and old chorioiditis, but remains normal in detachment of the retina. In commotio retinæ typical delay and decrease of the process of adaptation are met with.

HANKE and TERTSCH (445, **Some rare infections of the eye**) report the case of a child eight days old that presented the clinical picture of a moderate blennorrhœa due to a pyocyaneus infection. The second case was that of a child seven months old with chronic irido-chorioiditis, associated with exudation into the pupil and vitreous, which resulted in perforation. Cultures taken from the pus in the vitreous showed the affection to be due to the micrococcus intracellularis meningitidis epidemica. The third case was one of ulcus serpens, or at least of a hypopyon keratitis that greatly resembled an ulcus serpens, which was excited by a bacterium belonging to the group of bacillus proteus vulgaris (Hauser). In the fourth case panophthalmitis quickly supervened upon a traumatism. A very virulent bacillus was found that failed of cultivation.

UNNA (446, **Pfeiffer's influenza bacillus the excitant of intraocular disease**) reports a case of panophthalmitis determined pathologically and bacteriologically to have originated in influenza. In consequence of the pathologically changed structure of the anterior segment of the globe, Pfeiffer's bacillus passed from the conjunctival sac into the interior of the eye.

According to ZUR NEDDEN (447, **Studies concerning the occurrence of bactericide substances in the conjunctival sac, together with remarks concerning the healing process in conjunctival catarrh**), the inflammatory products contained in the conjunctival tissue in infectious diseases of the conjunctiva, and carried away in part by the conjunctival secretion, possess bactericide properties, while the tears and the normal secretion of the conjunctiva are no bactericide. The more severe the inflammation and the greater the secretion, the higher is the bactericide power of the secretion. The kind of infec-

tion and its duration exert no influence. The conjunctival secretion loses its bactericide power when subjected to a temperature of 58° for three quarters of an hour, but it can endure drying for a short time without loss. In the healing of the conjunctivitis after the application of astringents, the direct killing of the bacteria and their mechanical removal play a rôle not insignificant but subordinate to the active participation of the tissue in the subjugation of the disease, for the astringents call forth a marked hyperæmia and an increase of the bactericidal products of inflammation which are essential to the healing. In the healing of corneal ulcers also, the direct killing of the exciters of the disease by disinfection and astringents has not the same importance as their annihilation by the bactericide inflammatory products of the corneal tissue itself. Zinc sulphate is the most efficient means for inducing this increase. A specific affinity of zinc to certain kinds of bacteria (diplobacilli) is not proven.

LINDAHL (448, **Contribution to the knowledge of the bactericidal action of the lachrymal fluid**) first investigated the influence exerted by the lachrymal fluid upon pneumococci and streptococci and found that the bactericidal action of the tears upon pneumococci was uncertain. He could not draw positive conclusions because the result of his experiments varied so greatly. He thinks that this was due partly to the use of different cultures of different virulence and power of resistance, partly to the fact that the tears were taken from different patients. Against streptococci the tears exert a weak bactericide action. In the second part of his work the author seeks to show which constituent of the lachrymal fluid it is that exercises the bactericidal action, and ascribes this property not to the salts in the fluid, but to a bactericide albuminous substance of enzyme-like nature. The efficacy of the lachrymal fluid is destroyed by a certain degree of heat, is influenced by an increased quantity of salt, and is markedly greater at the temperature of the body than at a lower degree of temperature. After centrifuging the cells the fluid retains its bactericide property. Lindahl thinks that the bactericide material comes not from the serum, but from the lachrymal glands or the conjunctiva.

HELLGREN.

Febr (449, **Disease of the optic nerve produced by atoxyl**) reports a case of pemphigus and lichen ruber treated by the injection of a 20% solution of atoxyl. During the treatment visual disturbances appeared. The pupillary reaction was normal, the central vision moderately reduced, the visual field greatly contracted on the nasal side; the entire optic nerve disk was uniformly white and the retinal arteries small. The prognosis is relatively good, because the condition slowly improved after discontinuance of the drug.

Possek (450, **The thyroid gland and the eye**) speaks first of the cases of tetanus that occur after thyroid operations. Concomitant and subsequent symptoms are the trophic disturbances in the regions of epithelial organs, such as the nails, the hair, and the lens. The onset of cataract is frequently observed. In tetanus cataract, the destruction of the epithelium of the capsule leads to later destruction of the lens fibres and thus to the formation of the cataract. This cell death is probably the result of a toxic action of a poison to which we ascribe the tetanus as an autotoxicosis. The possibility of a formation of cataract in consequence of strumous degeneration of the thyroid gland and of the changes thus induced in the physiological function of this gland is excluded.

It appears from the experiments of Wernecke (451, **The action of thyreotoxin on the eye**) that the cell poison formed in the body of an animal as thyreotoxin exerts a decided influence upon the cells of other organs, at any rate of the eye. It induces typical changes which are not to be obtained through normal serum, or the serum of healthy animals. Injected into the blood its action is much slighter; the principal changes produced are an enlargement of the thyroid gland and some extremely slight changes of the posterior epithelium of the cornea.

Fortunati (452, **Picric acid in injuries of the eyes with chemicals, particularly lime**) used picric acid in 83 cases of lime-burn of the eye with very good results. His method of treatment is as follows: Removal of the particles of the caustic, followed by irrigation for several minutes with warm physiological salt solution. When he fears that the irrigation may not be sufficient to remove all the particles of the caustic, he instils a drop of pure olive oil between the lids every five

minutes for from half an hour to an hour. Then an ointment containing 20% of picric acid is applied twice daily, morning and evening. In 101 cases of burns with chemicals, including the 83 lime-burns, perfect recovery was obtained in 62, while slight corneal opacities persisted in 33. In order to study histologically the anatomical changes produced in the cornea by lime, and to explain the mechanism of the action of the picric acid, he experimented on rabbits and large dogs. By these experiments it was shown that lime quickly produces a cloudiness of the cornea, due for the most part to coagulation of the protoplasm through the penetration of the poison, and that this gradually diminishes toward the periphery of the focus of burning. Here the initial ulcer is formed which later extends to the neighboring apparently less injured tissue. The remedy exercises its healing action chiefly on the superficial opacities at a distance from the necrotic focus. A contact of 24 to 36 hours between the cornea and the picric acid is sufficient to clear up such opacities and promptly heal a superficial excoriation of the epithelium so that the cornea regains its normal appearance. The question here is not that of a reconstruction of destroyed elements, but that of a direct influence upon the cell protoplasm which revives. CALDERARO.

WIRTZ (453, **Contribution to the question of the relations between auto-intoxications and diseases of the eye**) observed two cases of auto-intoxication. In the one case there was a paralysis of the trigeminus with keratitis, in the other a retrobulbar neuritis, both referable to an intestinal affection. After removal of the latter the ocular affections disappeared.

LEBER (454, **Concerning the biological specific diagnosis, particularly in syphilitic diseases of the eye**) was able to demonstrate syphilis to be the etiological factor in two cases of eye disease by means of the serum diagnosis.

TRIBONDEAU and BELLEY (455, **Action of the X-rays upon the eye during development**) have tested the effect of the X-ray upon the as yet unopened eyes of kittens, and confirmed the findings of other authors that they induce a dermatitis with alopecia of the lids, obstinate purulent conjunctivitis, keratitis, and changes in the aqueous. They also describe as new findings that the X-rays induce the following symptoms: (1) premature

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opening of the palpebral fissure; (2) retarded formation of pigment in the iris and the membrana nictitans; (3) formation of cataract, which appears about the thirty-fifth day, but may be recognized earlier when the eye is under the influence of atropin; (4) microphthalmus of the irradiated eye, which is a sequela to its hypobiosis; (5) formation folds and cell proliferation of the outer layers of the retina, which resemble the changes described in glioma of the retina (Wintersteiner).

BERGER.

When a drop of a 1% solution of dry tuberculin precipitated by alcohol is instilled into the conjunctival sac of a healthy man, no reaction takes place, while persons having tuberculous foci of any localization and extent exhibit a characteristic reddening of the conjunctiva in from 6 to 24 hours. In doubtful cases this renders the diagnosis of tuberculosis positive. CALMETTE (456, **Concerning the early diagnosis of tuberculosis by means of the reaction of the eye to tuberculin**) considers this ocular reaction to be a simple, positive, and harmless means of diagnosis.

SCHENK and SEIFERT (457, **The diagnostic signification of the ophthalmo-reaction in tuberculosis**) recommend the use of the ophthalmo-reaction when there is a suspicion of tuberculosis.

According to DE LAPERSONNE (458, **Is the ophthalmo-reaction dangerous to the eye?**), Calmette's ophthalmo-reaction (instillation of a 2% solution of tuberculin) is harmless in the majority of cases. Very rarely it occasions a severe conjunctivitis, or an ulcerative keratitis, as observed by the author in two old people. The conclusions to be drawn are not positive in all cases. In children it is better to use a 1% solution of tuberculin. When diseases of the eye exist, tuberculin should not be instilled, as the latter is useful in ophthalmology only for the purpose of demonstrating the tuberculous nature of diseases of the adnexa. It is also pointed out that the ophthalmo-reaction should not be tried in old people.

BERGER.

BARBIER (459, **Apropos of the ocular reaction to tuberculin**) considers Calmette's ophthalmo-reaction not to be relied on to show the presence of tuberculosis. In one case keratitis resulted from the instillation of tuberculin into the conjunc-

tival sac. In the subsequent discussion, Renon mentioned that he had observed complications in three out of fifteen cases in which he had obtained a positive ophthalmo-reaction from the instillation of a 1% solution of tuberculin into the conjunctival sac: in one a conjunctivitis was produced, in one a slight keratitis, and in the third a severe keratitis resulted.

BERGER.

STEPHENSON (460, **The Calmette serum reaction in ophthalmology**) has used this new diagnostic test locally for eye diseases in thirty cases with the following results: Six children with relapsing phlyctenular keratitis, all of which showed reaction. Three cases of disseminate choroiditis, all of which were positive. In five cases of specific interstitial keratitis there was no reaction. One out of three cases of episcleritis was positive, as were tuberculosis of the iris and cornea and chronic iridochoroiditis. ALLING.

BALDWIN (461, **The ophthalmo-tuberculin diagnostic test; some clinical observations**) and his associates have used the Calmette test in 137 cases of known and suspected tuberculous patients as well as a few apparently healthy individuals. Two cases out of 45 of pulmonary tuberculosis did not react, but they were weak, anæmic, and with temperature, and such patients, it is known, have feeble reacting powers to tuberculin. Eight out of 57 apparently healthy persons reacted, but some of these were constantly associated with tuberculous patients. ALLING.

MACLENNAN (462, **Observations on the ophthalmo-reaction to tuberculin**) has made 100 observations: 70 with the Calmette tuberculin, 25 with the "old," and 10 with the "new" tuberculin. In from three to ten hours the positive reaction manifests itself. It commences with slight injection of the conjunctiva near the caruncle, and a little lachrymation. In slight reactions nothing else may be seen. Unless the change be carefully looked for it may be missed; it is, however, quite characteristic and can easily be recognized by comparison with the normal eye. The amount of the reaction is very variable, and bears no relationship to the severity of the disease. All degrees are observed from local redress to a muco-purulent conjunctivitis. The occasional over-violence is the only drawback to the test; it might be better to use a solution

of 1:200 as a preliminary test. Only perfectly healthy eyes are suitable for the test; the slight reaction depends upon comparison between the two eyes. MacLennan finds: that Calmette's claims are fully justified; the test reveals lesions which are benign and clinically unsuspected; that when a subcutaneous injection of "old" tuberculin has given a positive or negative reaction, the ophthalmo test confirms the diagnosis; that "old" tuberculin seems to answer equally well for the oculo-reaction.

Of 25 *tuberculous* cases, 23 gave a positive reaction in from 2½ to 10 hours. In 12 *suspect* cases, 9 positive reactions were obtained; 20 *tuberculous* cases tested with 1:200 Calmette's tuberculin gave 19 positive results; 20 cases apparently *free from tubercle* were inoculated with Calmette's solution 1:100, only 4 gave a positive reaction; 25 *clinically tuberculous* were subjected to the test with 1:100 of "*old*" tuberculin, 12 reacted positively, and of these 10 had given Calmette's reaction. The "new" tuberculin gave untrustworthy results.

The author instilled into healthy eyes 1% solutions of phenol and glycerin without evolving the slightest redness, lachrymation, or swelling of the caruncle; so the presence of these bodies does not as Calmette says vitiate the test when "old" tuberculin is used. The results show that while the great majority of tuberculous cases give the reaction, a few do not.

Chantemesse describes a similar reaction in typhoid. A strong solution of typho-toxin gives a violent reaction in typhoid, a mild one in its absence. This reaction was also obtained in the eye of a rabbit which had previously been injected with typhoid bacilli. T. Harrison Butler.

Webster and Kilpatrick (463, **Notes on 121 cases tested with Calmette's tuberculin**) tested 121 of the cases at the Mount Vernon Hospital for Consumption with Calmette's tuberculin. 115 of the patients were suffering from or assumed to be suffering from tubercular disease of the lungs. 6 cases were presumably healthy individuals. The dry form of tuberculin was used dissolved in water. One drop was instilled, and often seemed to be more than sufficient. The results can be summarized as follows: All definite cases with tubercle

bacilli in the sputum gave the reaction. In cases with physical signs of phthisis but quiescent as judged by temperature, some gave the reaction, others did not, and there was no obvious cause for this variation. In doubtful cases some gave the reaction, others did not. In presumably healthy individuals two reacted and two did not, but those who gave the reaction were not physically examined. No conclusion could be drawn as to the relation, if any, between the extent of the disease and the degree of the reaction. 7 cases showed a rise of temperature after inoculation. The changes produced ranged from a little lachrymation to the most acute injection of the conjunctival vessels accompanied by marked epiphora.

T. HARRISON BUTLER.

The abstracter has recently obtained a very severe reaction in a child apparently free from tubercle, but suffering from acute eczema of the left brow and upper eyelid.

KALT (464, **Aggravations of intraocular tuberculous lesions by instillations in the conjunctival sac**) reports two cases of aggravation of diseases of the anterior segment of the eyeball as the result of the instillation of a 1% solution of tuberculin into the conjunctival sac. In the one case, a man 64 years of age who had iridochoroiditis of the right and sclerokeratitis of the left eye, so great an increase of the infiltration of the right cornea took place that within a week the vision had fallen to quantitative light perception, while there was no reaction to the tuberculin in the left eye. The second case was a child with tuberculous iritis that appeared to be benign, but showed a high degree of aggravation within a week after the instillation of the tuberculin. In the meeting of Nov. 5th Kalt reported in regard to the first case that the vision of the right eye was still reduced to quantitative perception of light.

BERGER.

TRUC and MAILLET (465, **Studies concerning the ophthalmo-reaction. Comparative reaction of dionin and tuberculin**) find that the instillation of tuberculin into the conjunctival sac of a person with tuberculosis produces a reaction very different from that caused by dionin. The presence of disease in the eye forms no contraindication to the instillation of tuberculin because in no case was an aggravation of the eye disease induced thereby. In tuberculous patients the

ophthalmo-reaction was of the same intensity in both eyes. In two non-tuberculous cases the ophthalmo-reaction took place. In every case of tuberculosis the ophthalmo-reaction was observed, but in two it was slight. The authors conclude from their experiments that the instillation of tuberculin into the conjunctival sac has a diagnostic value and is harmless. BERGER.

According to the experiments of CHANTEMESSE (466, **The eye diagnosis in typhoid fever**) a drop of water containing in solution $\frac{1}{10}$ *mg* of dry typhus-toxin instilled into the eye of a healthy man, or of one suffering from some other disease than typhoid fever, produces some redness and lachrymation within two or three hours that completely disappears within four or five hours more. In patients with, or convalescents from, typhoid fever the reaction reaches its maximum in from six to twelve hours and persists till the next day. It is characterised by redness, lachrymation, and the formation of a sero-fibrinous exudate. This method of diagnosis is harmless and enables one to tell in a few hours whether the patient is suffering from typhoid fever or not.

According to KRAUS, LUXENBERGER, and RUSS (467, **Is the ophthalmo-reaction of Chantemesse useful for diagnostic purposes in typhoid fever?**) extracts from toxic typhoid stocks, from paratyphus bacilli B, from colon bacilli, and thinned tuberculin rarely cause inflammatory symptoms after conjunctival instillation aside from a slight degree of secretion. The same extracts call forth inflammatory reactions in typhoid and other like diseases, which are usually confined to the conjunctiva of the lower lids. The ophthalmo-diagnosis of Chantemesse with typhoid extract is not as good as the serum diagnosis of Gruber-Widal, which is to-day the most exact and valuable method of diagnosis.

According to BALLABAN (468, **Concerning the value of subconjunctival injections and its theory**) it is almost positively proven that salt enters the blood-vessels by diffusion or osmosis from a solution injected subconjunctivally. Injections of salt solution do not in the least promote the fluid current in the anterior chamber, yet they greatly influence the amount of albumin in the aqueous. The salt stimulates the conjunctival vessels and nerves, in a reflex manner the

stimulation is transferred to the neighboring vascular region of the ciliary body, and the protective material contained in the blood serum enters the aqueous in markedly increased quantity. Hence subconjunctival injections have a decidedly favorable influence on chronic diseases within the eye, such as iridocyclitis, opacites of the vitreous, retinochoroiditis and especially hemorrhages into the vitreous.

ZIMMERMANN (469, **Percutaneous treatment with iodin**) recommends for cases of eye disease in which iodine treatment is indicated and the internal administration of preparations of iodin, or the subcutaneous use of iodipin, is not well borne, an ointment of iothion, 25% for adults, from 10% to 25% for children, using vaselin or equal parts of vaselin and lanolin as an excipient. If this ointment is rubbed into the skin iodin can be demonstrated in the excretions for a week. Particularly good results were obtained in the treatment of scrofulous eye diseases in children where iothion was used for months at a time, so that Zimmermann sees in these inunctions a substitute for cod-liver oil.

SCHIOETZ (470, **Tonometry**) has observed that pilocarpine exerts a greater reduction of tension than eserin, that atropin produces a weak, transient increase of tension, that cocain reduces tension, but in a predisposed eye increases it, and that morphin causes an increase of tension.

HELLGREN.

FRANK (471, **Magnetic and non-magnetic properties of iron alloys**) notes that alloys of iron with manganese are either wholly or nearly non-magnetic while alloys with nickel, chromium, and tungsten may be more magnetic than pure iron, a point of practical importance in ophthalmic surgery. The subject was thoroughly treated recently by Sweet.

ALLING.

BEAL (472, **Spontaneous bursting of an artificial eye with a double wall**) observed a case of spontaneous bursting of an artificial eye with a double wall which followed a sudden closure of the eye. Milliken has described a similar case. In order to avoid such an accident, which in the author's case caused an erosion of the cornea demonstrable with fluorescin, he recommends that either the posterior wall of the artificial eye should be made stronger, or that a perforation should

permit communication between the cavity of the artificial eye and the conjunctival sac.

Sachs used the lamp designed by him to render visible intra-ocular foreign bodies, tumors and detachments of the choroid, and to examine the upright image, the fundus, and Purkinje's figures. VUELLERS (473, **New diagnostically important results from transillumination with Sachs's lamp**) saw in and after iritis or iridocyclitis a shining of the iris in different places caused by deficiencies of the retinal pigment. In iridodialysis a great part of the retinal pigment is deficient, and the same is true in patients who complain of dazzling. In secondary cataract the places shine most brightly in which opacity is present in consequence of particular conditions of refraction. In a case of very dense membrana pupillaris perseverans the pupil was shown to be perfectly round.

BORSCHKE (474, **The theory of skiascopy**) describes the different theories of skiascopy.

LEWIS'S (475, **Blindness following the injection of protargol in the lachrymal sac**) patient, a woman of 50, consulted him with lachrymal abscess which had ruptured externally. After reduction of the swelling the sac was irrigated with a solution of protargol 25%. This was followed by orbital cellulitis with proptosis, congestion of the disk and retinal vessels. Blindness from optic atrophy resulted. ALLING.

III.—REMEDIES AND INSTRUMENTS.

476. FRANK, I. **Ocular anæsthesia by alypin.** *Amer. Jour. of Ophth.*, Nov., 1907.

477. DOLGANOW, W. N., and LEWITZKAJA, V. Z. **The action of thiasinamin in some diseases of the eye.** *Russk. Wratsch*, 1907, No. 40–42.

478. v. PFLUGK. **Oily collyria.** *Klin. Monatsbl. f. Augenh.*, xlv., ii., p. 505.

479. VOIGT, ALFRED. **Protection of the eyes against the action of ultraviolet rays of a very bright source of light by a new nearly colorless kind of glass.** *Arch. f. Augenh.*, lix., p. 48.

480. BORDIER, H., and NOGIER, TH. **New pupillometer.** *Rev. générale d'ophtalm.*, xxvi., p. 529.

481. KRUSIUS, FRANZ F. **A disk deviometer.** *Arch. f. Augenh.*, lix., 1., p. 26.

482. KOSTER, GZN. **A means to counteract the disturbing influence of the electric city current upon the sideroscope.** *Ibid.*, p. 49.

483. EMANUEL, K. **A new lid holder.** *Klin. Monatsbl. f. Augenh.*, xlv., ii., p. 563.

484. KOSTER, GZN. **A fixation forceps.** *Zeitsch. f. Augenh.*, xviii., No. 6., p. 521.

FRANK (476, **Ocular anæsthesia by alypin**) believes this drug to be superior to cocain because it is prompt in action and lasting in effect, without interference with the accommodation or pupil, and it does not dry the cornea. He uses a 4% solution. ALLING.

DOLGANOW and LEWITZKAJA (477, **The action of thiosinamin in some diseases of the eye**) used thiosinamin, in the form of subcutaneous and intramuscular injections, in twenty-three cases of white and gray optic nerve atrophy, retinitis pigmentosa, and chorio-retinitis pigmentea syphilitica, and from the clinical histories of these twenty-three patients draw the following conclusions: 1. Thiosinamin is of use in the eye diseases named, because after its use there is an improvement of the central vision and a widening of the visual field. 2. Enlargement of the visual field was observed even in cases in which thiosinamin exerted no influence upon the vision, usually the action is parallel in both. 3. The improvement of vision varies in dependence on the form of the process, its duration, its degree, and other obscure causes and conditions. 4. After the administration of thiosinamin is stopped the improvement does not disappear, at least not for two or three months, the time during which the authors had opportunity to watch their patients. 5. No after results were observed. HIRSCHMANN.

v. PFLUGK (478, **Oily collyria**) uses a 1% eserin oil, a 2% cocain oil, a 1% pilocarpin oil, and a 1 or 2% acoin oil. These collyria are sterile and remain so in open bottles, are unirritating in use, eserin oil never decomposes, and cocain oil does not injure the corneal epithelium. A 1% acoin oil exerts its analgesic action almost at the instant of instillation.

The **new pupillometer** of BORDIER and NOGIER (480) is an improvement on the Robert Houdin instrument modified by Badal. Its advantage consists in the possibility to measure the diameter of the pupil rapidly and in any light. With regard to its construction the reader must be referred to the original article. BERGER.

The apparatus of KRUSIUS (481, **A disk deviometer**) is used for the objective measurement of the angle of squint and consists of a glass disk 60 : 120 *cm* in circumference upon which the angle degrees are arranged extending out from the centre in the form of an upright cross, calculated from the tangents with the eyes to be observed 60 *cm* in front of the disk. Corresponding verticals and horizontals are drawn through the degree points thus marked out so that the disk is cut up into little fields. In the centre is fixed a small electric lamp, and a second lamp is freely movable. One eye is fixed on the first lamp and then with the second the position of the corneal picture on the other eye is determined. From the interval between the two the degree of deviation is read on the disk.

In order to obviate the disturbing influence of the electric street current upon the sideroscope KOSTER (482, **A means to counteract the disturbing influence of the electric city current upon the sideroscope**) uses a small magnetic rod which is so placed beneath the instrument with its poles in the opposite direction, that the magnet checks the electric current.

The lid holder of EMANUEL (483, **A new lid holder**) is a modification of Schmidt-Rimpler's springless lid speculum in accordance with Hess's principle.

The fixation forceps of KOSTER (484 **A fixation forceps**) are bent at the ends at an angle of 45°. The teeth are placed as if the forceps were straight.

ILLUSTRATING DR. VERHOEFF'S ARTICLE ON "THE HISTOLOGICAL EXAMINATION OF THE EYES IN A CASE OF AMAUROTIC FAMILY IDIOCY."

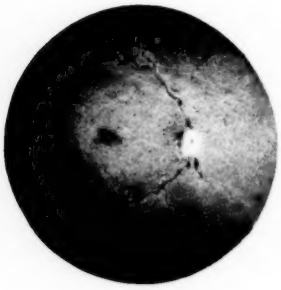

FIG. 1.

FIG. 2.

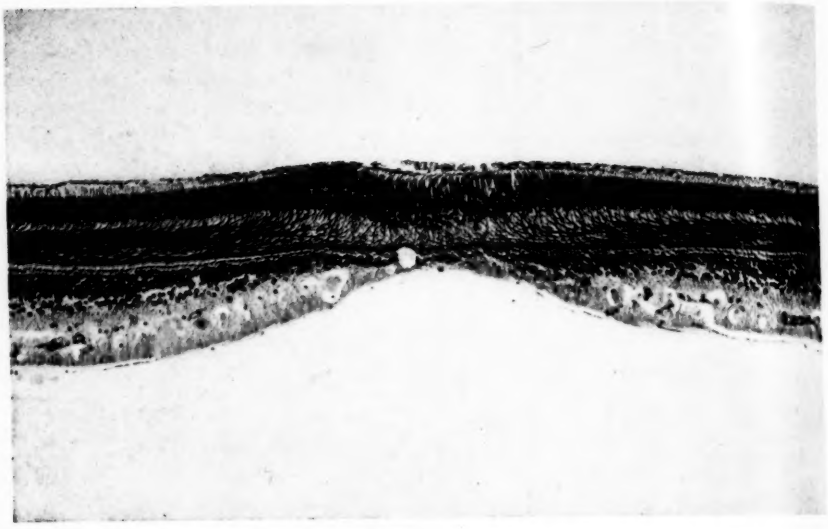

FIG. 3.

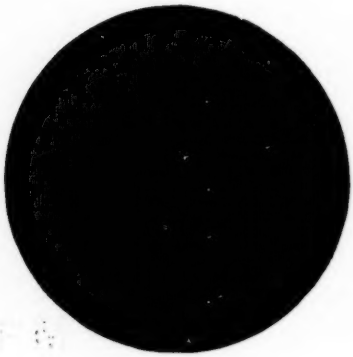

FIG. 4.